

October 1965

Agriculture

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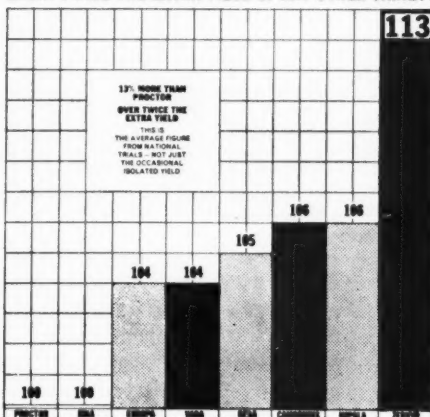
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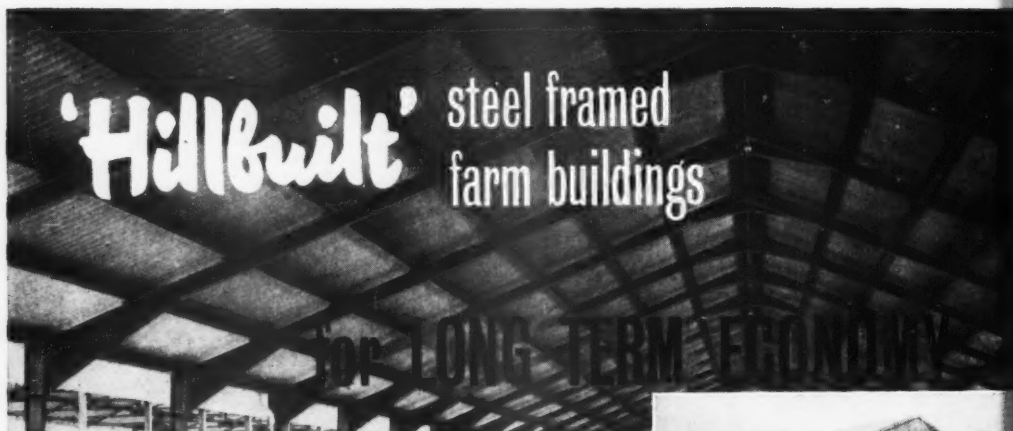
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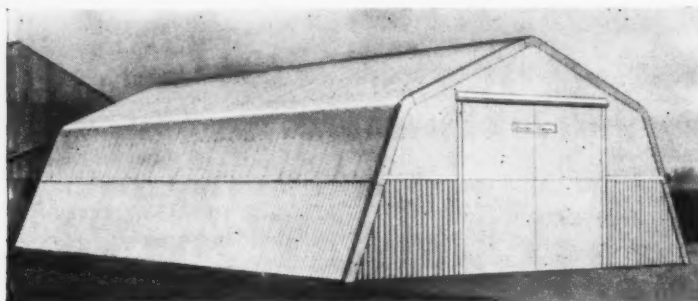
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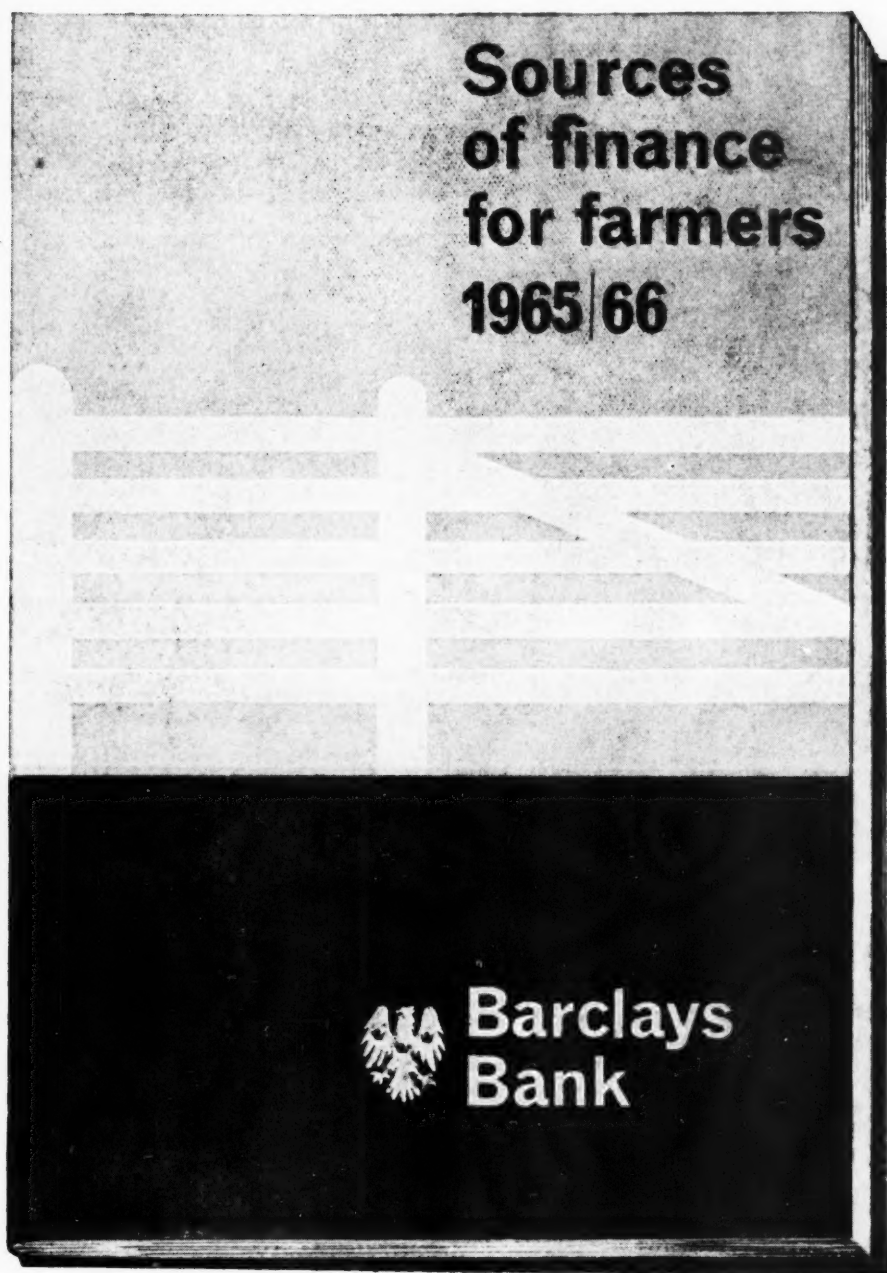
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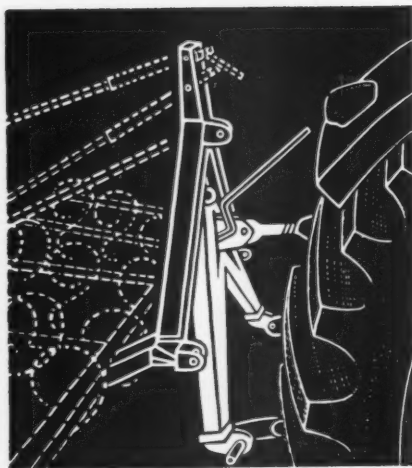




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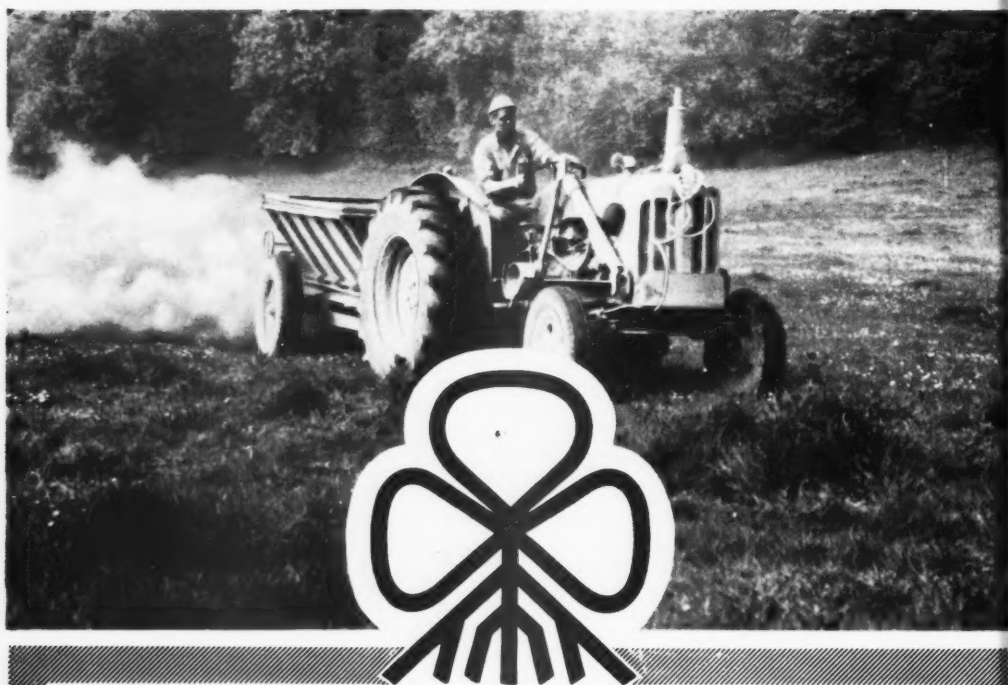


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Agriculture

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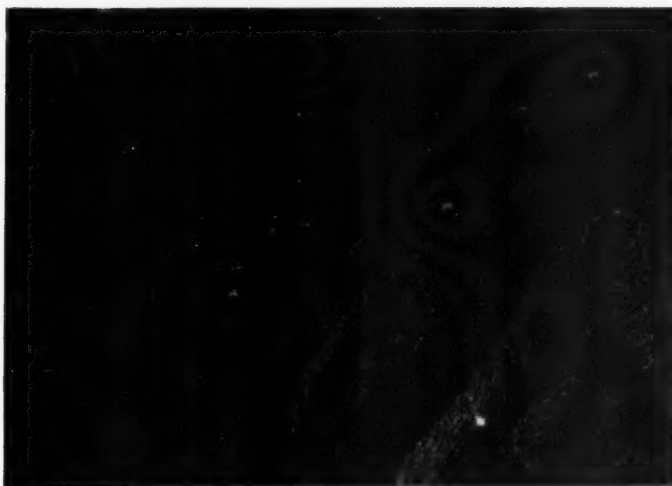
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Grain in Store

THE beetles which cause damage to home-grown grain in store do not come in from the field; they are brought on to the farm with imported grain, other animal feeds and empty sacks. Their increase is much influenced by temperature and humidity. The beetles can survive the winter in store, but do not breed readily until the temperature is over 65°F.

Dried grain often reaches bins and floors at temperatures up to 80°F, and even higher, making an ideal environment for insects. In small bins such grain will not cool naturally to a safe temperature for two or three months, and hardly at all if it is in large bulks. Grain should therefore be cooled by the proper use of drying machinery, by ventilation through ducting in bins or on floors, or by refrigeration. Drying should be even and moisture content low, otherwise heating due to moulds may arise and be exploited by beetles and mites.

Grain beetles and mites can remain from harvest to harvest in cracks and dead spaces in empty stores, and can breed in residues. Hygiene must therefore be of a high standard. Spraying of all storage areas with the insecticide malathion, before harvest, is a wise precaution. As a further precaution, where there has been a persistent history of infestation, this insecticide can be added to the grain as it passes into store but the dosage must not exceed 18 oz of a 2 per cent dust or $\frac{1}{2}$ pint of 3 per cent emulsion per ton.

If further advice is required, farmers are advised to get in touch with the National Agricultural Advisory Service locally.



Beef from Ayrshires

Richey Turner

IN the eleventh (1962) edition of that reputable and massive text-book on the science and practice of British farming, Watson and More's *Agriculture*, Ayrshire crosses are not listed among the recognized types of stores for fattening. In the recent past it has been said of the breed that 'for beef the Ayrshire is of little account'. The greatly changed market and prospects for beef in the sixties do not seem to have much changed this 'non-beef' attitude to the Ayrshire. It is estimated that about 50 per cent of the male calves from Ayrshire herds are still slaughtered at, or soon after, birth.

Demand for beef

Yet there is no stronger demand for any single product of British farming today than for beef, and there is every sign that this situation will persist. The rest of the world is eating more beef, including countries whose exports of beef formerly entered the British market in substantial quantities. Also, the pattern of demand for beef here has changed. Small and lean joints are wanted, and to meet this point-of-sales requirement the beef animal must be fattened in about eighteen months and killed at around nine hundred-weights, a lifetime and a final weight that are both low by standards of the past. British beef production is now providing about 70 per cent of national consumption but a shortage of beef is steadily reported and is certainly indicated by its high price to housewives. It is not simply a case of there being scope to raise the 70 per cent share of the home market for beef; it may well be a far more realistic assessment to say that beef in the average British diet may become less common unless home production can supply more than 70 per cent.

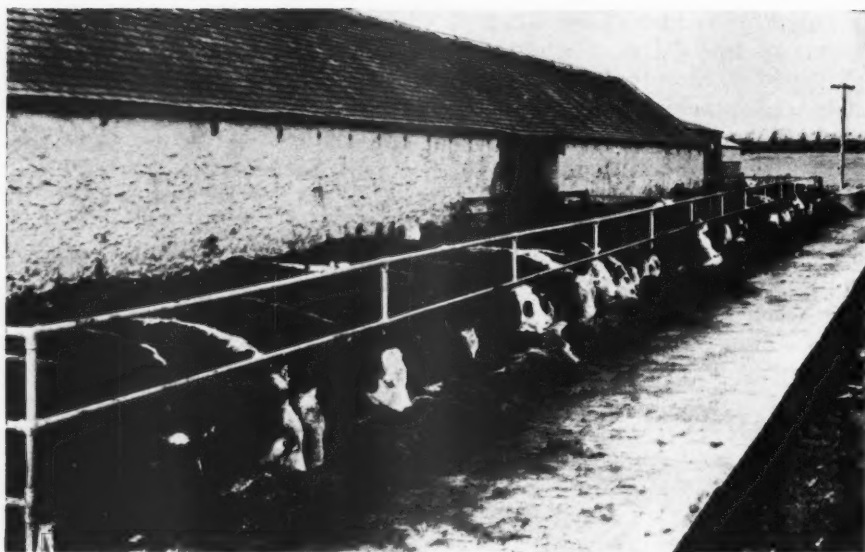
The Achilles heel of the situation and its expansive opportunity is the supply of beef calves. The cow is neither a prolific nor speedy producer of its young. Also, the modern pattern of demand, deplored though it often is by master-butchers and gourmets, necessitates the briefer life and lowered final weight output per fattened animal. The demand for beef calves cannot be satisfied by the beef and dual-purpose herds—indeed, it is reckoned that seven out of every ten beef calves are derived, directly or indirectly, as crosses from the dairy herds. This is the *present* situation. If beef is not to remain in short supply or not to become even scarcer, it seems a reasonable assumption that more calves for beef must come from the dairy herds. But this rising demand for beef is not matched by a rising demand for milk, and it is doubtful, particularly in the next five years, if any major increase will occur in the number of calves available from the dairy herd. Can calves from Ayrshire herds, one of our important dairy breeds, continue to play so minor a role in beef production? Ayrshires form over 20 per cent of the total dairy herd in England and Wales, and in Scotland the proportion is about 84 per cent. How much can the 'non-beef' attitude to Ayrshires be altered?

The Leaths system

These are questions arrived at by assessing the beef market and the basic supply situation, and perhaps no industry is more aware of the pitfalls of theoretical thinking than agriculture. Fortunately, for some years an accurately measured and practical attempt to answer these questions has been conducted at one of ICI's commercially-run development farms, The Leaths in Kirkcudbrightshire, in the heart of the Ayrshire herd country. There, in 1957, it was decided to set up a beef production enterprise based on Beef Shorthorn cross calves from Ayrshires. An important condition for success became apparent in the early years of this pioneering venture. For systematic management and marketing it was necessary to have evenly-aged batches of the beef calves. To ensure this, all cows due to calve between

The Leaths dairy herd





Yearling Hereford cross calves on easy-feed silage plus 6 lb barley per day

September and January were mated with a beef Shorthorn bull, but all those due to calve after this time were mated with an Ayrshire bull. This may seem to risk the possibility of a shortage of pure Ayrshire calves for the main herd, but in an area where the breed is dominant there is always a supply of good heifers if at any time the number of dairy herd followers is insufficient.

With evenly-aged batches of home-bred calves it was possible to develop a system of rearing and fattening that enabled most of the animals to be sold at eighteen months in the spring period when prices were highest. In simplest terms, the Leaths system has three main stages: (1) housed rearing; (2) grazing; (3) housed fattening. It was considered essential in this system for the animals to gain at least $1\frac{1}{2}$ lb live weight per head per day throughout their eighteen months of life.

The three stages

In more detail, stage one, the first winter, starts the calves on whole milk. After one week this is replaced by a milk substitute. A high-protein calf food is introduced early and good-quality hay is always available. At twelve weeks there is a change to a predominantly cereal concentrate and silage feeding is also started. After a few days the calves take to silage readily, and consumption per head rises to about 6 lb a day by the end of this first rearing stage. Well-made, good-quality silage is, of course, important.

Stage two begins in April when the calves are put out to grass, after being given some form of husk control. As a further precaution they graze for the first six weeks pasture that has not been used by other stock for at least six months. The field is split into paddocks, one paddock per week being grazed. Until about mid-June the stocking rate is five calves per acre but after this, with the aftermaths from silage cutting available, the grazing is less intensive. However, this grazing period as a whole represents an

intensive use of grass, and nitrogen fertilizer is applied in March and in further dressings as required—on average 120 units of nitrogen are given per acre to paddock-grazing area.

The third stage starts when grazing finishes towards late October. The animals are then housed and self-fed on silage. Additional concentrate feeding is 4 lb of rolled barley and 2 lb of beet sugar pulp per day per head. These are average figures, for in any one year the level of supplementary concentrate feeding may be varied according to the quality of silage available or according to the daily live weight.

The economic story

Over three years, 1962–64, 212 animals reared and fattened by this system were sold.

Average figures were:

	108 Steers	104 Heifers
Weight at birth (lb)	77	73
Weight at sale (lb)	900	832
Lifetime (days)	533	549
Liveweight gain per day (lb per head)	1.6	1.4

For these 212 animals the economic story can be summarized as follows:

Output	Average per Animal	Variable Costs	Average per Animal
	£ s.		£ s.
Sale price	69 3	Milk and milk substitute	2 3
Calf subsidy	8 7	Calf food	7 11
	77 10	Concentrates	8 8
		Hay, grazing, silage	7 15
		Vet. and medicines	1 10
Less value of calf	8 10	Bedding	3 2
Total	69 0	Total	30 9

Average GROSS MARGIN per animal £69 less £30 9s. = £38 11s.

The gross margin per acre achieved by this system of beef production can be calculated. At The Leaths, the rearing and fattening per animal involves the production of just over one acre of grass for both grazing and silage; in 1965, 96 home-bred animals have used the grass and silage from 100 acres during their lifetimes. This indicates a gross margin per acre slightly below the gross margin per animal, i.e., about £37 per acre. By comparison, fat lamb production achieves about £18 an acre and good cereal production about £35. To reach as high a gross margin per acre, dairying must be at least semi-intensive, but even on a closely similar gross margin per acre basis, dairying carries a much higher labour requirement. Beef production by the system developed at The Leaths has a low labour demand, which means that a gross margin of £37 per acre can make an appreciable contribution to the farm's net profit per acre.

Health record

For any stock management system a poor animal health record can bedevil its economics. In five years at The Leaths 450 calves, home-bred or purchased, have gone through this system. Eight died at the calf stage

when in the severe 1962-63 winter there was an outbreak of pneumonia; in the rest of the period only another eleven have been lost as calves. After the calf stage very little trouble has been experienced, though in a breed diversion from the main venture, using some Charolais crosses, two of these died in the grazing stage and two more died in the final stage. The close maintenance to the target of a steady $1\frac{1}{2}$ lb gain per day is also good evidence of healthy response, as, too, is the relatively low cost per head for veterinary costs and medicines.

Economic success would not be more than temporary if the system produced beef of a quality below good acceptance standards at the ultimate market stage. Of 99 animals sold in 1964, 4 were classed as super-grade, 94 as grade A, 1 as grade B. This seems powerful evidence not only for the system of rearing and fattening, but also for the modern suitability of beef from Ayrshire cross calves. There is in any case other evidence that Ayrshire cows can produce beef animals; in 1963, 41 per cent of A.I.s with Ayrshire cows were with beef breeds compared with 36 per cent with Ayrshires and 22 per cent with other dairy breeds.

Advantages

One advantage of this system is that it can be flexibly expanded. Suckled calves can be bought and added to the number of home-bred calves. The number bought can be decided when the tonnage of silage available is known, and also when the number of home-bred animals reaching the third stage is known. If prices of suckled calves are too high at the time, however, the beef enterprise can still rely upon the home-bred animals alone. Currently at The Leaths the policy is to fatten about 200 animals for sale at eighteen months each spring, with approximately 100 home-bred and 100 purchased suckled calves in the final stage of the system. The suckled calves are, of course, only on the farm in the final stage and from 1963 and 1964 data show a gross margin per head of about £14, but this makes a useful addition to the system's throughput.

Though this is an intensive system, its costs are low as a result of relying as fully as possible upon the farm's grass and grass products. An important factor is the simplification achieved by producing the cross-calves during the same period and selecting this period so that the animals reach the finished stage when prices tend to be highest. Above all, when there is a world beef shortage that seems likely to persist for years ahead, many calves coming from dairy herds can be profitably used for beef instead of being killed at birth. At The Leaths, the beef enterprise has not been more than one part of the total farm activity, which includes 80 acres of barley, a milking herd of 120 cows and 56 young dairy stock, and 184 ewes; of the labour force of seven men, only one stockman was required to look after the calves and other beef cattle there. A beef section in a dairy farm can pay, and it has the merit of meeting a firm and expanding market.

The author of this article, **R. Richey Turner, B.Agr.**, is U.K. Development and Technical Service Manager in the Agricultural Division of I.C.I. Ltd. He comes from Northern Ireland farming stock, and his previous experience includes ten years with the Ministry of Agriculture for Northern Ireland.

The Small Farm

This article is the second in a series dealing with production opportunities on the small farm

Egg Production



W. S. Senior

MANY small farms provide their occupiers with a satisfying way of life and a satisfactory livelihood. These successful businesses based on small acreages vary greatly in cropping and stocking, and in their degree of specialization or diversification, but an intensive livestock enterprise is often an important feature, for a small acreage is no great handicap to such an enterprise. Egg production on the 40-acre holding can be carried out in much the same manner as on the 400-acre holding, for if modern techniques are followed the stock are housed throughout their lives. The larger farm has advantages when it comes to manure disposal, both in the matter of labour to handle the manure and land to absorb it, but these are much less decisive than the advantages which the large farm has in many other enterprises.

Most farmers realize that small-scale production tends to be high-cost production, except in the case of complementary enterprises using resources which are surplus to the requirements of the main specialism. One of their main anxieties concerns the size of enterprise which is necessary in order to achieve economic operation. Multi-million-bird units are being developed successfully. Will there still be a place for the medium-sized unit of a few thousand hens, or for the subsidiary enterprise of a few hundred? If so, what system should such units follow?

Choice of buildings

On the small farm 'a few thousand hens' implies special-purpose buildings, and there is little doubt that these should be controlled environment battery houses. There is rather more doubt about the type of cages that they should contain, and this affects the optimum size of house because an automatic mechanism is uneconomic on a short block of cages. Few fully-automatic systems have established lengthy records of trouble-free operation, and

very large battery houses appear to have only slight advantages (in capital cost and labour cost) over those housing two or three thousand birds in simple semi-automatic cages.

Unfortunately, the producer with only one house faces considerable disadvantages. If he markets through the British Egg Marketing Board, under the proposed contract scheme, his 'annual entitlement' will be divided into four equal contracts, one for each quarter of the year. The very unequal production pattern which is inevitable from a single house will thus be penalized. Similarly, producers who sell wholesale ('B' licence) or retail usually find that customer requirements for eggs of the various size grades cannot be satisfied unless three or four flocks, each in a different stage of the production cycle, can be maintained on the holding. The producer with three or four flocks is also in a position to make economical use of a rearing-house. On the very small farm it may be difficult to achieve the degree of isolation from adult stock which is often recommended, but there are many examples of successful commercial units where rearing is carried out on a site close to adult stock. There is little evidence to suggest that pullets reared in isolation give consistently better performances on their final laying site than birds which have been reared close to that site.

Size of unit

Three or four houses, with a total of perhaps 10,000 birds, seem able to achieve most of the economies which are readily available. Labour costs can be close to their minimum level, and quantity premiums from the packing station can be close to their maximum level. A food consumption of roughly 10 tons per week should be sufficient to obtain compounds at near minimum price, or to justify an investment in milling and mixing equipment. The enterprise could, in fact, consist of rearing unit, laying unit and compounding plant, all of economic size and fully integrated. Larger units are unlikely to achieve further economies of any significance by virtue of size alone, unless they reach a size which can support a packing station.

The competitive position of an efficient 10,000-bird unit seems likely to be very strong for at least the ten-year period over which its buildings would be nominally 'written-off'. At prices of eggs and feedingstuffs forecast for 1965-66, a modern hybrid under first-class management in this type of unit could be expected to produce a margin of egg and hen sales over food and chick costs of 16s. per bird. Miscellaneous expenditure of 2s. per bird would reduce this to 14s., or £7,000 on the unit. The farmer might expect to give three-quarters of his own working time to such an enterprise, and to require the full-time assistance of a woman or youth. The total hired labour bill (regular, casual and contract) would probably amount to £1,000 a year.

Return on capital

If the farmer's own labour is charged at £1,000, the remaining 'cash flow' of £5,000 represents a return on capital of 20 per cent in addition to complete recovery of capital in a ten-year period. This means that, if the farmer were able to borrow the entire capital requirement for buildings, cages, other equipment and working capital, he could pay himself £1,000 a year, pay interest at 20 per cent, and extinguish his loan over a ten-year period.

This result should be considered in relation to the risks involved, and it must be emphasized that the margin assumes first-class management. It

is also based on forecast 1965-66 prices, which may be more favourable than those which can be expected to prevail over the longer run. The proposed contract scheme will also affect new enterprises adversely: it would reduce the overall rate of return arrived at above from 20 to 16 per cent. Even if the returns are considered to be adequate, or attractive, the number of small farmers who are in a position to consider investment on the scale demanded by such an enterprise is likely to be rather small. The fixed capital requirements amount to about £15,000 and the working capital to roughly £7,500.

A subsidiary enterprise?

From these capital sums many will conclude that egg production on the small farm is of more interest as a subsidiary enterprise. When the egg price/feedingstuffs cost ratio was more favourable, small flocks on free range, and later on deep litter, made useful contributions to the economy of many small farms. Now it is common for free-range flocks to show negative gross margins, and the margin from deep litter flocks is usually low in relation to the building space occupied. Where buildings and labour are available, the wood and wire-netting Californian cage now seems the most suitable system. The cages can be fitted into almost any building to give good utilization of the space available, and stock-carrying capacity is roughly three times as high as on deep litter. Management is easier, regular labour requirements can be as low as one hour per day per 1,000 birds (even if these are in three separate flocks) and, most important, the bird's performance is usually better than on litter. Such cages can be installed in existing buildings for less than 10s. per bird.

The subsidiary enterprise will probably rely on purchased compounds and purchased pullets, and receive smaller packing station premiums, so that the margin between egg and hen sales and pullet and food costs may be no more than 7s. 6d. per bird. Miscellaneous costs might be 1s., but thanks to the utilization of spare ('free') labour and buildings, this still leaves a cash flow of 6s. 6d. per bird, or £325 on a flock of 1,000 hens if eggs are sold to the packing station. But if the farm is well situated for farm-gate sales, the premium prices on these can transform the situation. These premiums vary considerably between districts, and they usually involve a certain amount of trouble and inconvenience in a shop-keeping type of enterprise which many farmers would dislike. In order to earn them it may also be necessary to select a brown-egg-laying strain of bird with slightly higher production costs, but in favourable situations the net premiums are sufficiently high to make the producer-retailing egg enterprise a very suitable sideline on the small farm. It uses little or no land, it provides a satisfactory return to labour and to a capital investment of moderate magnitude, and it meets a demand from the housewife in ways which are an efficient and economical use of resources.

The number and size of such enterprises is rather severely limited by the extent of the local demand, but within this limit there is no reason why they should not continue to prosper. It is precisely this limitation which ensures that their operators have little to fear in the way of competition from very large units.

The author of this article is **W. Stuart Senior, B.Sc.(Agric.)**, who is Senior Agricultural Economist at Nottingham University. He has a special interest in the economics of egg production, and is a member of the Poultry Costings Advisory Council.

The Great Cattle Plague of 1865

Sherwin A. Hall

ONE of the most dramatic events in the history of British agriculture is recalled this month when the State Veterinary Service celebrates its centenary. In 1865 some cattle imported from Russia brought with them the virus of rinderpest. This was an alarming disease, characterized by rapid spread and high mortality. In this country there were no controls whatever to check it and the Great Cattle Plague of 1865 had begun. It was nearly two-and-a-half years later before it was eradicated. By that time between one-quarter and one-third of a million cattle had been lost.

The disaster was not accidental. Our continental neighbours were well aware of the ravages that rinderpest could cause and took active measures to keep it at bay. In this country nothing was done. Many years of freedom from the disease had lulled us into a sense of security. The re-awakening was an expensive shock. It was indirectly due to the industrial revolution.

The rapid expansion of industry throughout the first half of the nineteenth century had caused massive changes in the human population, both in size and distribution. In only 50 years the population of Britain had nearly doubled, from 11 millions in 1801 to 21 millions in 1851, and by this time the majority of people in the large towns were immigrants from the country. This was an age before social services existed. In the towns, housing was poor, water was scarce and drains were frequently non-existent. Supplies of wholesome food were inadequate for, with the change from the agrarian way of life, there were now large masses of townspeople dependent on others for the production, marketing and distribution of food. There were physical difficulties too. Before the railways were developed there was no means for the rapid carriage of perishables into the towns, and refrigeration was unknown.

The problem was partially solved by the town dairies. These were buildings where cows were kept right in the town as a source of milk and then meat. It was basically a wasteful system because it drained the national herd of breeding stock. It was also inadequate, and there were strident demands for the importation of cattle to increase the supplies of meat.

For many years the importation of cattle had been banned. In 1839 some cattle were brought in from the Continent and with them came foot-and-mouth

disease. Soon afterwards contagious bovine pleuro-pneumonia was likewise imported, but no heed was taken and thereafter the foreign trade was allowed to develop freely in the expansionist, industrial economy. In 1846 the Corn Laws were repealed and free trade became a political shibboleth.

Effect of free trade

Free trade in cattle meant free trade in cattle diseases, and the town dairies and markets became hotbeds of infection. Ailing animals were butchered for human consumption and those that died before they could be pole-axed often went the same way. Even aborted calves were sometimes eaten. It was the common practice to sell watered-down milk. Undoubtedly the consumers got a poor deal at the hand of the butchers, the cattle dealers and importers. The prosperity of this new class of merchants created an arrogant, self-seeking parliamentary lobby that successfully blocked all attempts at reform. It was because of this that rinderpest was imported.

The same political interests opposed the measures that were taken to deal with the disease. The dealers and importers adamantly refused to believe that it had been imported or that it was contagious, and they were supported in this view by such respected sources of opinion as *The Times* which announced:

We must say that every month's experience of this eventful year increases our incredulity respecting the theory of importation. That the conditions of the atmosphere are truly exceptional every man's senses will tell him, and we see the effect in all directions. Cholera is raging over a considerable portion of Europe, and the climate of England itself has been actually found compatible with the existence of yellow fever. Pigs have sickened, sheep have sickened, and horses have sickened. In France poultry have suffered from a strange disease, and it was feared that eggs, the last resource in cases of suspected food, would be no longer safe. Now, in the face of this universal testimony to the influence of some destructive element, is it consistent with philosophical principle to assume that the disease of horned beasts is utterly unconnected with the phenomena affecting all other animal life, and that though men, horses, pigs, sheep, and fowls would have suffered from the season, cows would have been absolutely exempt if a certain deck-load of cattle had not been landed at Hull from Revel?

This quotation clearly illustrates the widespread technical ignorance of the day. The cause of epidemic diseases was uncertain and there were many confusing theories on the subject. Some people postulated that there was a non-living toxic agent known as a miasma that arose from decaying organic matter (of which there was plenty in the streets!) and caused disease when breathed in by a living animal. Others maintained that disease was generated spontaneously within an animal and that, although the morbid agent was non-living, it could be disseminated from the diseased animals. People who believed that microscopic, living germs could be the cause of disease were very much in the minority in 1865, although it was not very long before the works of Pasteur, Koch and others firmly established the case.

Spread of the disease

The disease broke out in the town dairies of London, and by way of the markets and railways it soon spread throughout the country. A contemporary newspaper report describes the scene at Denny in Stirlingshire:

The cattle plague continues to rage here with undiminished virulence. Since Tuesday last no fewer than 32 deaths have taken place in the district, while there cannot be less than 80 head of cattle at present affected with the pestilence. On Saturday there were 13 unburied carcasses lying in two fields at Dunipace toll-bar, some of which had lain since Thursday morning. The dilatoriness manifested in the burial of the dead animals is

causing much comment, and there is no doubt that in one or two fresh cases which have been reported the disease has been contracted by the pestilential effluvia emanating from the carcasses after lying for three or four days above the ground. The two fields under notice, as may be supposed, presented a very melancholy sight on Saturday, the dead carcasses being scattered here and there, while fully thirty animals were staggering about in the last stage of the disorder. In two or three cases of the number dead, the struggle prior to death has, from the appearance of the ground, been terribly painful. One animal had thrown itself right on its back, and its horns were embedded to the root in the soil. The disastrous results of the plague are naturally causing great alarm in the district, and several holders of stock are slaughtering every animal in their possession, and selling the meat at 5½d. and 6d. a pound.

On veterinary advice the Government adopted a policy of slaughter but it failed to check the disease because no compensation was payable. Furthermore, it was applied haphazardly and ineffectually for the want of qualified staff and an effective organization. Although veterinary inspectors had been appointed following an Order in Council in late July, it was not until 14th October, 1865, that the Veterinary Department of the Privy Council Office was established on a firm basis.

By September the situation had become worse and a Royal Commission was appointed to investigate the problem and recommend a line of action. The Commissioners failed to agree and issued a majority report and two minority reports. They were agreed that slaughter should be discontinued and this advice was adopted.

Control of the disease

In November and December, 1865, the losses of diseased cattle mounted alarmingly. In February, 1866, public opinion was at last ready for stern action, and the Government rushed the Cattle Diseases Prevention Bill through Parliament in the course of only one week. This reintroduced compulsory slaughter but compensation was now payable from the local rate. At the same time severe restrictions were imposed on cattle imports and movements. This produced the desired effect and the disease was rapidly brought within reasonable bounds, although it was not until September, 1867, that it was eradicated. It was re-imported in 1872 and again in 1877, but on each occasion it was promptly dealt with by slaughter for the loss of very few animals.

The Veterinary Department of the Privy Council eventually merged with the land services to form the newly-created Board of Agriculture in 1889. Thus the present-day Animal Health Division represents one of the principal foundations of the Ministry of Agriculture, Fisheries and Food.

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Hybrid Heavy Pigs

J. A. P. Friedlander

SOME three-and-a-half years have elapsed since my Company's plans for heavy pig improvement were outlined in the February, 1962, issue of *Agriculture*. In the intervening period very real progress has been achieved within the initial breeding programme. Our fundamental aim is still, however, the production of lean meat from the heavy pig as economically as possible to meet the consumer's requirements, while at the same time providing both the producer and the processor with a fair return on their capital invested.

At the outset in 1958, a deliberate policy was evolved to select strains of pure-bred pigs for their efficiency in the following characteristics:

Economic weaner production.

Food conversion and growth rate.

Lean content (defined by carcass dissection).

The aim here was that, subsequent to an initial selection programme, the best pure-bred lines for each characteristic would be multiplied, and then be amalgamated in a three-way cross to produce the Walls Hybrid Heavy Pig, which would combine these three characteristics of economic importance.

Throughout the whole programme, a realistic scheme for testing was laid down so as to ensure that the results achieved within our tests would be repeatable on the farm. Furthermore, equal emphasis was placed on the fundamental requirement that the benefit accruing from these improvements should be shared between the producer and the processor.

Initial pure-bred selection

The foundation programme in 1958 and 1959 covered the five major breeds at that time—Large White, Landrace, Wessex, Essex and Large Black. Nine females of each breed were placed on test over four litters, two litters as pure-breds and two litters as first crosses; 164 litters completed testing, comprising 1,350 pigs. The completed results were costed and analysed to show the cost of weaner production, food conversion and growth



Elite Saddleback line



Elite Landrace line

rate, and the cost of producing 1 lb of lean meat. All pigs in this and subsequent tests were tested to a standard 260 lb live weight. The overall results are given in Table 1.

TABLE 1

FOUNDATION PROGRAMME

	Weaner cost	Liveweight food conversion	Age (weeks)	% Lean on deadweight
	£ s. d.			
Overall results	4 10 2	4.105	31 6/7	37.42
Pure-bred results	4 12 2	4.27	33 2/7	36.98
Cross-bred results	4 8 2	3.94	30 3/7	37.86
Best results (2 lines average)				
Saddlebacks	3 11 7	—	—	—
Large White	—	3.85	28 5/7	—
Landrace	—	—	—	41.20

Multiplication of selected pure-bred lines

It will be seen from the above results that two Saddleback lines were most economic for weaner production, that two Large White lines had the best food conversion and growth rate, and that two Landrace lines gave the highest lean content. The next stage, therefore, was to carry out an inbreeding programme to develop and multiply the pure-bred lines for each separate characteristic. The results of this inbreeding programme are given in Table 2, covering the period 1961–1964.

TABLE 2

FIRST INBREEDING PROGRAMME

	Weaner cost	Liveweight food conversion	Age (weeks)	% Lean on deadweight
	£ s. d.			
Initial selected lines	3 11 7	3.85	28 5/7	41.20
*1st generation	3 19 0	3.71	26 3/7	40.20
*2nd generation		3.38	25	40.40
*3rd generation		3.48	24 4/7	42.70
*4th generation	3 6 0	3.42	27	41.30
*5th generation		3.20	27	43.00
*6th generation		3.10	25	42.70

*All gilts litters.

(All results adjusted to a hog/gilt standard.)

Although very considerable improvements have been achieved within this inbreeding programme during the first six generations, it was felt that if this programme was continued on a limited base, an inbreeding depression could eventually result. After the sixth generation of this initial programme, therefore, new proven tested strains were introduced, so as to enlarge the breeding programme on a safer and broader base, and this occurred in 1963.

The results achieved over the first three generations following the introduction of new strains are given in Table 3.

TABLE 3 SECOND STAGE BREEDING PROGRAMME

	Overall results			Performance of best boar		
	Liveweight food conversion	Age (weeks)	% Lean on deadweight	Liveweight food conversion	Age (weeks)	% Lean on deadweight
1st generation	3.55	28 3/7	43.40	2.80	26	46.35
2nd generation	3.45	26 4/7	45.37	2.80	22 3/7	46.86
3rd generation	3.19	26 3/7	—	2.54	26	—
(Overall results are on hog/gilt standards)			(These results are on a boar standard only)			

The improvements which have been achieved to date compared with the initial selected stock are given in Table 4.

TABLE 4 IMPROVEMENTS GAINED

	Initial unselected pure-bred stock	Initial selected stock results	Current results	Improvements gained per pig on selected stock
Cost of weaner	£4 12s. 2d.	£3 11s. 7d.	£3 6s. 0d.	5s. 7d.
Liveweight food conversion	4.27	3.85	3.19	0.66
Age (weeks)	33 2/7	28 5/7	26 3/7	2 2/7
% Lean on deadweight	36.98	41.20	45.37	4.17

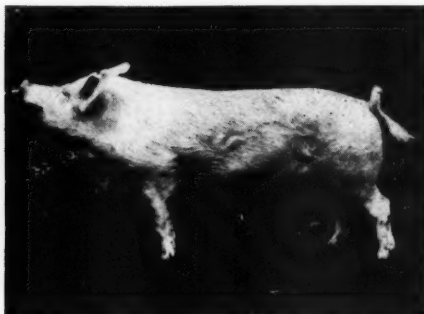
Hybrid development

As mentioned at the outset, the object of this breeding programme was to establish a hybrid pig which could meet the ultimate aim of securing lean meat more economically. The economic and lean characteristics that had been selected and improved upon with the three separate pure-bred lines had to be amalgamated into a hybrid pig, and two different hybrids that could arise were tested for their economic production of lean meat. The hybrids so tested were formed by crossing the foundation stock of pure-bred Saddleback females with Landrace boars, so as to produce a cross-bred Landrace/Saddleback female which was finally top-crossed with a Large White boar. The reciprocal cross that was tested was to use the same Saddleback females and cross these with a Large White boar to produce Large White/Saddleback gilts, which were subsequently top-crossed with a Landrace boar, and both hybrids were tested from the same parent pure-bred stock as utilized in our inbreeding programme of 1962-63. The results achieved are shown in Table 5.

Cross-bred female



Elite Large White line





*Final hybrid pigs at
260 lb live weight*

TABLE 5

RESULTS OF HYBRID LITTERS

Hybrid	Weaner cost £ s. d.	Liveweight food conversion	Age (weeks)	% Lean on deadweight	Cost per lb of lean
Landrace x Large White x Saddleback	4 5 0	3.79	29 2/7	41.9	3s. 8.1d.
Large White x Landrace x Saddleback	3 17 2	3.65	29	41.2	3s. 7.2d.

From these results it can be seen that the Large White \times Landrace \times Saddleback were more economic, but were less lean than the reciprocal cross. But in terms of cost per lb of lean meat these animals were more economic, and we have subsequently built up a hybrid programme on this particular structure. It is clear from these results that the hybrid has amalgamated the improvements effected in the pure-bred lines, as these results were achieved from using the first three generations of the original inbred programme (see Table 2). It should be possible, therefore, that as we go forward using improved pure-bred lines, very considerable improvements in the hybrids themselves will be secured in the future.

In Table 6 the results of the 1964 hybrids are shown and clearly indicate an improvement on the 1963 hybrids. These results are compared with the results secured with our original unselected pure-bred stock of 1958-59, with the current national average performance of heavy pigs and with the estimated current performance of Danish pigs.

TABLE 6

COST OF LEAN COMPARISON

	Walls 1959-60	Hybrid 1964	U. K. National Heavy Pig 1963-64	Danish 1962-63
Food conversion	4.10	3.55	4.22	3.81
Age (days)	223	204	217	196
Weaner cost	£4 10s. 2d.	£3 15s. 7d.	£5 2s. 7d.	£4 0s. 0d.
Fattening cost	£12 11s. 1d.	£10 18s. 7d.	£12 15s. 5d.	£9 5s. 10d.
Total cost	£17 1s. 3d.	£14 14s. 2d.	£17 18s. 0d.	£13 5s. 10d.
% Lean	37.43	41.70	37.50	43.27
Cost per lb lean	4s. 5d.	3s. 5d.	4s. 7½d.	4s. 1d.

It will be seen that, on the important criteria of cost per lb of lean meat, the 1964 hybrids are well in advance of Danish average costs, and that our lead should be more than sustained with the hybrids of 1966-67, which will be coming forward from the third generation of the new breeding programme (see Table 3).

Our ultimate object, however, is not merely to demonstrate how well a hybrid pig can perform, but to ensure that similar animals can be made available for use by our normal commercial pig producers. Our intention is that our own Company should carry out the basic genetic selection programme (we in no way wish to participate in actual breeding), and that both the male and female stock required for this hybrid should be secured through the co-operation and expertise of breeders who will carry out the necessary multiplication of the elite seed stock thrown up by the genetic selection programme. Such stock should be made available in increasing volume, and this we believe is one of the practical means of making a positive contribution so that improvements in pig production can be secured in the future, thus ensuring that we can be competitive in terms of cost and quality.

The author of this article, **J. A. P. Friedlander, B.A.(Cantab.)**, is Research and Development Director for T. Wall and Sons (Meat and Handy Foods) Ltd. Before joining the firm he was farming on his own.

Farm Safety: Standard Controls for Agricultural Machines

NEW recommendations which should in the long term make a major contribution to increased safety on farms have just been published by the British Standards Institution. The aim of the recommendations is to encourage designers and manufacturers of self-propelled agricultural machines such as combine harvesters, trench diggers, and the latest types of sugar beet and potato harvesters, to adopt the principle that 'a given direction of movement of any control should produce a consistent and expected effect'. It is hoped that agreement on the location and direction of movement of operator's controls will ultimately follow the publication of these recommendations. Similar recommendations relating to tractor controls have been available for some time so far as light and medium tractors are concerned. The new recommendations, now published in British Standard 3904, cover some fourteen controls, dealing with the method and direction of operational movement, the recommended location and, in some cases, the form of permanent marking considered essential to safety.

The earlier the crop, the better the prices

Early Strawberries in Southern England

Hilary M. Hughes

WITH modern air freight, strawberries are now available in Covent Garden wholesale market on most days of the year. Yet the market looks forward to the *English* produce. The first few fruits, of what later will become a flood, come from specialist growers in April. These very early fruits are from plants grown under glasshouse forcing conditions and must, of necessity, be a luxury commodity for a limited market easily over-supplied.

Depending on the season, the first of the cloched crop appears in early May, often from a few specialist producers who have holdings tucked away on sheltered slopes in the warmest parts of Devon and Cornwall. Some growers, to aid nature, have successfully introduced electric soil-heating wires under their cloches and so manage to market their berries a few days earlier than their rivals.

At this stage the strawberries are still expensive (wholesale prices around £1 per lb) and the fruit is generally sold in small quarter-pound punnets, often with an individual cellophane cover. When the majority of the producers of cloched, or otherwise protected, strawberries start to pick in the middle of May, supplies increase and the price tumbles. Soon the market is well supplied with quarter-pound punnets wholesaling at 3s. to 1s. 6d., a price that brings the fruit well within the average household purse.

Early in June the fruit ripens in the field on one-year plants from sheltered sites, and by late June strawberries are being gathered feverishly wherever the fruit is grown. The quarter-pound punnets are discarded in favour of half-pound, or even pound, punnets, and wooden trays holding ten to twenty pounds of berries for the quick-freeze, canning and jamming firms are in full use.

Earliness commands high price

Earliness in strawberries commands a rewarding premium, and much skill and ingenuity have been shown by growers in their efforts to get early fruit. The main areas of production are in South Hampshire and the Isle of Wight, Sussex, the Cheddar district of Somerset and Kent, with smaller areas in

Devon and Cornwall and producers in many other counties on the warmer soils.

The exact area of cloched strawberries is not known, but probably 70 to 90 acres are protected by the well-known glass barn, or tent, cloche. Although the cropped area may seem very tiny in comparison with other agricultural, or even horticultural, crops, the gross return per acre can be in the region of £3,000. Many holdings are small, only two or three acres, and the early strawberry crop is the only crop. This has led to monoculture with its attendant soil and disease problems, but has also led to specialization and careful production of a high order.

In addition to glass cloches, plastic covering is now being used increasingly. One of the most successful methods is to support a continuous tunnel of plastic sheeting over the plants by means of simple wire hoops. The secret is to get the plastic tight over the hoops and to secure it with light tie wires that hook into the hoops. At first, tunnels covering several rows of plants were used, but most growers have found that covering a single, or a staggered double, plant row is best. Fruit from tunnels ripens six to ten days behind similar varieties protected by glass cloches, but the tunnel is far easier to handle. It is a simple matter to push up the polythene like a blind between the hoops, in order to spray, irrigate, or pick the plants. One of the big disadvantages of glass cloches is the problem of handling them, to say nothing of the high annual glass breakages!

Another use of polythene is to lay it flat over the plants, secured by battens or other methods. This gives early ripening, even before glass cloches, but as the plants are forced the fruit is rather small and has been variable in quality. Polythene can also be put over plants and held down with glass cloches and later removed.

All these methods involve protecting the plant from mid-January onwards, after the essential winter chilling period. The covering warms the soil by trapping sun heat. The warmer and more sheltered the site, the greater the benefit from the various forms of covering. Wind is a great enemy and windy sites are quite unsuitable for early production.

Plastic sheeting, supported over wire hoops, is used to forward early strawberries on sheltered sites



Because the one-year, or maiden, plant produces a few bold flower trusses earlier in flower than those on two- or three-year plants, maiden plants are always used for early work. Besides giving earlier flowers, maiden plants produce fewer, bigger berries, ideal for this high-quality trade. The runners have to be replanted every year—generally from late August until early October. One of the problems is to obtain enough reasonably priced early runners for planting at these times; later planting results in very tiny crops per plant. Irrigation of newly-planted runners can be a problem on the small holdings, where only expensive, and low-pressure, mains water is available. Some of the disappointing crops this year were due to drought conditions during planting in 1964. The planting of strong runner plants every year probably enables strawberries to be grown year after year on the same soil, a system of undesirable monoculture forced on the specialist producer by the small size of the average holding and the difficulty of finding any alternative, high-output, crop.

The area of early production in South Hampshire lies between Southampton and Portsmouth where warm, gravelly soils, good winter light intensity and proximity to the sea ensure good flower trusses and early growth in the spring, with little or no danger of frost.

Efford Experimental Horticulture Station lies to the west of Southampton Water but has some sheltered fields suitable for experimental work on early strawberry production. Many experiments are being carried out at Efford to test new varieties, to compare various times and methods of covering, planting times and distances, herbicide programmes, irrigation, manuring and selection of runners, amongst other projects. The results are of immediate interest to the early producers, and the large attendances at the Open Days held each year in early May, before everyone has become too busy picking their own crops, show that growers over the whole of southern England understand the need to keep up-to-date in the production of this crop. The Hampshire Strawberry Group, of prominent growers from each area, also visits the Station and advises on the experimental programme.

A plastic 'blind' replaces the top cloche glass and aids picking once the crop is ripe



Red core disease and varieties

Because of the monoculture, soil-borne diseases are a problem. Red core, due to a soil fungal disease, is a real menace on many holdings. At one time, in the thirties, all varieties were susceptible to this disease, and it was the introduction of the red core field-resistant variety, Early Cambridge, bred by Sir Rowland Biffen at Cambridge, that saved this specialist industry. A range of field-resistant varieties produced by Mr. D. Boyes, also from Cambridge, was eagerly taken up by the industry after the war and Cambridge Vigour is still a popular early variety. Mr. R. D. Reid, of Auchincruive, Scotland, raised the useful Redgauntlet, the present-day mainstay of many producers, and his new varieties, under test at Efford, are being carefully watched by local growers.

In places where red core is not a problem the early Cambridge Prizewinner is popular, especially in the south-west. Elsewhere the tough, general-purpose variety Cambridge Favourite is also used for early work, particularly in Cheddar and Kent. Although most growers take care to use the Ministry of Agriculture certified runner scheme when buying runner plants (particularly if propagating their own runners for early planting the next year), some producers have retained their own stocks of varieties that do well under local conditions.

Brightness, colour, size and firmness of the berry seem more important to the market than flavour. It must be admitted that the early strawberry is never so well flavoured as the later fruits, ripening under warmer and longer days in the open. New varieties thus tend to be judged on these market points and on productivity and earliness, rather than flavour.

Autumn production

An interesting development is the increasing out-of-season production during the autumn. Certain varieties produce a second lot of flowers during July and August to crop in September to October. These long-season varieties, giving two good flushes of fruit, are preferable to the true 'perpetual' varieties, mostly of Continental origin, which produce flowers and fruit from June until September but seldom in any reasonable quantity. Glass cloches or other forms of protection can be used to ripen the berries in September as the days get colder, and this second crop, mostly produced from the variety Redgauntlet, is a useful source of additional income.

The autumn crop has one disadvantage, since it means a second worrying time for the grower! Strawberry picking is always a feverish time and a battle to get the fruit picked, graded, packed and sold. Strawberries are one of the most perishable crops grown, and the skilful picker is never likely to be supplanted by the machine. This is the chief reason why the small producer, provided he has an efficient transport and marketing system, will always produce a better pack than the large-scale grower dependent on gang labour to pick his crop. It is also the reason why the market and the public prefer the locally-produced, fresh and bright strawberry to the imported product.

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The N.I.A.E. reports

Some points selected from the 1963-64
Annual Report of the National Institute
of Agricultural Engineering

by **S. R. O'Hanlon**

Tractor safety

THE safety and comfort of tractor drivers working under conditions of higher speeds and greater power and at times in adverse weather are matters to which the National Institute of Agricultural Engineering has devoted a great deal of experimentation and ingenuity. Once impact and crushing tests have cleared a cab or frame on safety grounds, practical features concerning actual operation are carefully investigated. In the case of closed cabs, these include measurements of noise heard by the driver, visibility, access and interference with the use of implements when carrying out basic cultivations. Laboratory tests produce similar deformations to those that may occur by the tractor rearing backwards or rolling sideways on a hill. And such overturning tests are also required if the cab or frame is designed to incorporate specific features intended to prevent it from continuing to roll during an overturning accident.

Trials have been made to develop a guide rail and ramp system, so that tractors can be driven at a constant forward speed across a slope and will overturn when the uppermost wheel ascends the ramp. The intention is to initiate sideways rolls so that identical sideways rotational velocities occur when overturning commences. To simulate rearward rolling, the top link hitch point is connected by chain to a ground anchor and the tractor is driven at four miles per hour up a slope of 1 in 3. When the chain becomes taut the tractor overturns rearwards. This is the method used during all the Institute's tests to date.

Information received from five overturning accidents on steep hillsides in the United Kingdom indicates that rolling would probably have continued had the tractors not been fitted with safety cabs incorporating anti-roll horns.

Root and vegetable harvesting

A root and vegetable harvester capable of dealing with a wide variety of crops by means of interchangeable attachments is being developed. The construction of three experimental machines, each with the same basic

lifting device, has speeded up this project. One machine harvested (untopped) white turnips, red beet and carrots, both in single rows 12 in. apart and in double rows not more than 6 in. apart, the crop being dug with driven double disc shares and lifted by gripping the tops between special V-belts. Progress was also made with the development of a topping unit. Another machine, fitted with serrated cutting discs instead of the disc shares, harvested F1 hybrid cabbages and maincrop onions satisfactorily.

The third machine was fitted with agitating bars to remove soil below the lifting belts, and dealt well with leeks and gladioli. The Institute tried out this machine on Brussels sprouts: with the standard V-belts, about 5 per cent of the sprouts were damaged, but with special belts (which have a wide and soft rubber facing) the damage was negligible and the crop well harvested.

Handling fruit

Thought on the handling of fruit in orchards has resulted in a hand-moved pallet truck, which has been tried out at Luddington Experimental Horticulture Station and in commercial orchards. It enables a picker to move a well-based bin through the orchard as picking and filling proceed and lower it to the ground when full.

An unusual method of moving bins filled in a dwarf pyramid orchard has been studied and compared with the use of conventional equipment. A two-wheeled tractor-drawn trailer carries four bins of fruit suspended under its chassis, which can be raised and lowered by the tractor's hydraulic lift. The bins can thus be lifted off bogies used for transport between orchard and store.

A low-chassis self-loader has been designed and constructed experimentally, mainly for use in orchards. The engine and transmission are at the rear of the vehicle. This machine, which handles the Institute's 40 × 48 in. well-based bins, will be used to develop bin-handling techniques.

Glasshouse irrigation

Very promising results have followed the introduction of a modified tensiostat in the bench system of automatically watering pot plants. If trickle lines are used, these are normally controlled either by hand or time clock to keep the sand in a moist condition and so act as a reservoir from which the plant can obtain its water needs. But although bench sands may in many cases hold up to 30 per cent by volume of water, the water-retaining characteristics of the sands are usually such that undesirable high tensions occur in the pots long before all this water becomes available. It follows that because of the hourly and daily variation in the rate of water loss, very frequent adjustments are necessary when time-clock control is used if timely but not excessive applications are to be made.

The Institute suggests that a sounder basis for control may be to relate applications to the water tension in the sand; thus when a limiting tension is reached, a further application is made automatically. This is the function of the modified tensiostat: it limits the water tension in the sand to a pre-set level and adjustment is provided so that high limiting tensions can be imposed during winter months if a drier regime is desired. Unlike the original tensiostat, which was a vacuum device, this pressure switch operates above atmospheric pressure and no deterioration in performance due to the formation of air locks is anticipated.

Solar radiation in tomato houses

The need for glasshouses to have a high transmission of solar radiation in winter has been emphasized by monthly measurements at the Efford and Fairfield Experimental Horticulture Stations. Single-span houses orientated east-west have a considerable advantage in this respect over the traditional single- or multi-span houses orientated north-south. Mr. R. I. Edwards, in his paper at the Institute's Subject Day last year, quoted an example in single wooden one-tenth-acre vinery houses with 24 in. glazing orientated north-south. Here, at eaves' height, the transmission of solar radiation was at a minimum of 48 per cent in winter and a maximum of 65 per cent in summer; at bench height in a similar half-acre block the winter transmission was further reduced by shading from adjacent spans. But a narrow asymmetrical house orientated east-west had a winter transmission of 65 per cent.

For general crop production, much wider east-west houses are now being built. Measurements made in a 60-ft-wide, clear-span east-west house of steel and aluminium show that the best use would be made of the available solar radiation in such a house by having the rows of plants running across it and the path placed on the north side. The transmission of this house was at a maximum of 68 per cent in midwinter and a minimum of 64 per cent in summer. By orientating the house east-west, the transmission of solar radiation in winter, when the energy from the sun is very small, will be high; and it will be lower in summer when cooling may be a problem.

The 1963-64 Annual Report of the National Institute of Agricultural Engineering is available from the Institute, at Wrest Park, Silsoe, Bedford, price one guinea.

Gravel and Sand

A NEW map, recently published by the Ordnance Survey for the Ministry of Housing and Local Government, shows for the first time the essential facts concerning the distribution and working of gravel and associated sands. It is the latest addition to the national planning series of 1/625,000 (10 mile to 1 inch) maps of Great Britain. The present map covers all of England south of the Lake District and the whole of Wales. From this area over 85 per cent of the sand and gravel of Great Britain is produced. The map is obtainable from Edward Stanford, Ltd., 12 Long Acre, London, W.C.2, and other Ordnance Survey Agents, price 12s. 6d.

Fish Farming

F. T. K. Pentelow

IN this country sea fish has for a long time been so plentiful, so good and so cheap that the farming of freshwater fish, except for re-stocking angling waters, has hardly been practised at all until the last few years. It is very different in continental Europe and the Far East where, for generations, carp and other herbivorous species have been reared and cultivated with all the skill and application commonly devoted to the more usual branches of animal husbandry.

This kind of fish farming has recently been encouraged in the United States, where in the South and mid-Western States the use of farm ponds for the production of 'pan fish' has become something of a vogue. It has not been practised in this country since monastic times and for two reasons is, I think, unlikely to catch on. First, the population at large has no taste for what they call 'coarse fish' and, secondly, our summers are generally too cool and too short to allow the fish to grow at a rate which would be economic. There is, however, a growing interest in the cultivation of salmon and trout as they are high-value food fish acceptable to the British public. Furthermore, they attain their maximum growth rates, and convert their food most efficiently, at temperatures between 10 and 20 degrees Centigrade. So far, no one has successfully cultivated salmon on a commercial basis, though they have been reared to maturity in ponds for experimental purposes.

Rainbow trout

The best fish for cultivation has been found to be the rainbow trout. It is hardier, grows better and seems to be rather more adaptable to farm conditions than the native European brown trout; it has become the foundation of a quite considerable industry in Denmark.

The technique of rainbow trout farming is essentially very simple. At the breeding season, which is usually the spring, though in some races it is the autumn, eggs, to the number of about 600 per pound weight of fish, can be stripped from ripe females into a bowl and fertilized with milt similarly



Nailsworth Trout Farm, Gloucestershire

expressed from a male. After having stood for about an hour in water to allow the shells to harden, the eggs are transferred to hatching trays, which used to be grills of glass rods but are now more usually baskets of perforated metal or plastic. The eggs are put into long narrow boxes made of wood, concrete or fibre-glass, and are supplied with a constant flow of good quality water as free from silt as can be arranged. There the eggs are left until the little fish have hatched. In earlier days there was a constant daily routine of picking out dead eggs, for fungus growing on them could spread and kill others. Nowadays it is usual to add a dilute solution of the fungicide malachite green to the boxes about every other day, and there is no need to disturb the eggs at all until at least the eyes of the developing embryo can be seen through the shell, or even until the eggs begin to hatch.

Feeding

The incubation period depends on temperature. If the water is at about 10°C, it will be about a month; if the temperature is less than that, as it often is in this country in March and April, the incubation period is longer. Eventually the fish hatch and, up to this stage, losses should be very small; a hatch of 95 per cent is quite usual. For about a fortnight the young fish continue to live on the food remaining in their yolk sac. They then begin to need food and it is in the early days of feeding that most difficulties are experienced; it takes great care and skill to avoid heavy losses.

The little fish need a protein food, extremely finely ground, rich in all the vitamins, and they need it very often. The best food at this stage is raw liver but with the decline of the horse and the improvement in the health of cattle, cheap liver is hard to come by. Other things, like low-grade white fish in Denmark, meat offals, milk curds and wastes from salmon canneries in the United States, are coming into use, very often with a variety of vitamins added. It is highly desirable at first to feed at about two-hourly intervals throughout the hours of daylight, and in the long days of our northern summer this has posed an increasingly difficult labour problem. In Scandinavia mechanical feeders have been developed to inject food into the ponds at set intervals.

Water supply

As soon as the little fish are on the feed they are transferred to outdoor ponds. These may be long and narrow ('raceways') or circular, and must have a good flow of water through them to maintain the oxygen content and to remove the excretory products—particularly ammonia. It is essential that the ponds can be completely drained, both for the removal of fish and to keep them clean. In fact, a site for ponds is very often the most important factor in determining the practicability of a fish farm. The supply of water must be adequate and reliable; a stream or spring which may dry up is useless, and one which is liable to diminish seriously in drought has to be looked at in the light of its minimum yield, i.e., what it is likely to be in a dry, hot summer when, owing to the high air temperature, a good flow of water is necessary for the health of the fish.

The water supply must also be free from the risk of pollution. Nowadays pollution is more likely, in a good-quality stream, to result from accident or carelessness than from planned discharges. The river authority will keep a careful eye on such discharges, but they all have to be taken into account. Finally, the water supply must be at a sufficient head to supply the hatchery and to provide a flow through the ponds, and there must be a suitable channel into which they can drain. What this means is that the easiest place to make a fish farm is on the site of an old water mill. There the mill head provides the water supply at a convenient height, and the area between it and the natural channel provides the ground for the ponds; the ponds can be drained into a low-level carrier or direct into the main channel. Of course, it is easily possible to have too much water and the possibility of flooding has to be guarded against. Many rivers have been inadvertently stocked at the expense of a fish farmer through insufficient attention to this danger.

Importance of grading

As soon as the fish are growing well, the frequency of feeding is gradually reduced. The particle size is increased in stages and the fish are put on to a cheaper and less carefully controlled feed. Then, at intervals, as differences in growth rate inevitably become apparent, the fish are graded, generally into three size groups, which are then segregated. This prevents the development of cannibalism (for trout are carnivorous) and improves the growth of all groups. Grading is very important and the best farmers take a great deal of trouble to ensure that the contents of any one pond are of uniform size. The usual aim is to produce 'portion fish' of 5 to 6 ounces weight in about nine months from hatching, and the fastest growing fish achieve this rate in Denmark.

As in all forms of animal husbandry, the economics of the business depend on a reliable supply of cheap food. Conversion rates obtained in practice have not, as far as I know, been published, but at high growth rates they may be something like four to one; slower-growing fish will be less efficient. So expensive food cannot be afforded, and both in this country and Denmark the material now used is low-quality sea fish and fish offals. In fact, trout farming competes with mink farming for its raw material. For that reason, the successful farms catering for the food markets here have been situated in Lincolnshire, East Yorkshire and Pembrokeshire, near the fishing ports of Grimsby, Hull and Milford Haven respectively. These are white fish ports and that is the main food in this country, but in Denmark fish farms rely

mostly on trawled herring. Experimentally, specially in America, vegetable protein meals like pulses and soya have been tried with some success, but presumably owing to cost, and perhaps low conversion rates, they have not come into commercial use in Europe. Recently some suppliers of animal feedingstuffs have been making up proprietary pelleted foods for trout. Some of them have very high conversion rates and are excellent for experimental purposes and for raising fish for re-stocking, but I have not heard whether they are economic if the fish are being reared for the food markets.

Disease control

For efficiency, fish at all stages have to be kept at very high densities and consequently diseases are an ever-present threat. Cleanliness, careful attention to detail and a flair for spotting when fish are 'off colour' are good safeguards, but the use of sulpha drugs and antibiotics, largely on an empirical basis, has done as much for the control of fish disease as for the health of farm animals in general. In fact, the last serious disease to affect the Danish farms turned out to be a dietary deficiency; it broke out when herrings began to be used as food. This produced a vitamin B₁₂ deficiency and now this, with some minerals, is added to the herring diet.

The future

In recent years in Norway, the Vik brothers have been growing rainbow trout in sea-water ponds with great success. The fish can be kept at very high densities, they grow very fast and they develop and retain a pink flesh (which the ordinary farm-reared fish do not). They have concentrated on producing fish of from 4 to 6 pounds in two or three years for the smoked trout market. It is an attractive development, but the economics are greatly assisted by the availability of very cheap electric power to pump vast quantities of seawater through the ponds.

There is a good deal of interest in the application of this technique to the production of salmon. It has been found practicable, but so far a domesticated salmon of the size and quality of a wild fish of the same age which has spent a year or two roaming the oceans has not been achieved. It probably will be before long.

Of course farming the sea is a likely prospect for the future; the Ministry and the White Fish Authority are already making very good progress in rearing flat fish, plaice and soles, under domestication, but this is a very different subject from the farming of freshwater fish.

F. T. K. Pentelow, O.B.E., M.A., F.I.Biol., was an Assistant Naturalist in the Fisheries Department from 1925-1946. He then became Chief Inspector, and later Chief Officer, of the Ministry's Salmon and Freshwater Fisheries Laboratory, until he retired last year.

*The Hubbard Comet, a new
white-feathered, brown-egg bird,
recently introduced from America*



THIS IS THE SECOND ARTICLE BY

Marion Martin

IN WHICH SHE DISCUSSES THE
ECONOMIC FORCES OPERATING
AGAINST MAMMOTH UNITS

Egg Production in the U.S.A.

The Methods

WHILST optimum economic size in terms of cost of production and market conditions has considerable bearing on scale of enterprise, so too has the type of production method practised. Apart from the small 'backyard' type of poultry unit consisting of 50 birds or less (which, incidentally, formed 50 per cent of the total of all poultry farms reporting in the U.S. Census of 1959), the main methods of production to be considered in the States are:

- (a) Contract production programmes.
- (b) Contract marketing programmes.
- (c) Independent semi-integrated operators (with which can be included the co-operatives).
- (d) Independent integrated operators.

Contract production programmes

Under this system the producer is paid by the operator of the programme for supplying the facilities and labour for the production of eggs. The finance necessary for the provision of the facilities is the responsibility of the

producer, any loan required usually being arranged between the producer and a lending agent. All eggs produced are the property of the contractor who supplies the pullets, feed, medication, etc. He also specifies in most contracts quality control requirements and exercises field supervision. The contractor markets the eggs either through his own packing station or by other arrangements; he may own a feed mill from which feed is supplied to his producers.

Many producers taking part in such programmes are new to the industry, building and equipping laying houses in order to participate. They are popular in low-income areas, the poultry unit being only a part-time occupation for the producer and his family. Flock sizes, although ranging from small flocks to large, are in general about 3,000 birds. From the viewpoint of the contractor, such flocks are satisfactory because (a) they are sufficiently large to keep egg handling costs comparatively low, (b) the finance required is within the capabilities of the producer, and (c) many smaller units, as opposed to fewer larger ones, are preferred because firstly the contractor spreads his risks, and secondly he is able to organize placements of pullets amongst his producers so that an even supply of eggs is forthcoming throughout the year. For these reasons and because of the nature of the producers involved in such programmes, it is not likely that individual unit scale of production will increase. The number of units operated by the one contractor might, however, be such that he was involved in production from a very large number of birds.

Contract marketing programmes

Under these programmes the producer agrees to sell eggs to the contractor under certain conditions. Production methods are generally laid down and supervised by the contractor, and the producer is generally paid a premium over prices received for eggs from non-quality control producers. The main goal of such programmes on the part of the operators is to obtain an even seasonal supply of high-quality eggs which were not obtainable on the open market. Little financing of producers is done by buyers. Since premiums are often paid both for volume of eggs delivered (thereby reducing egg collection costs to the operator) and for even distribution of eggs throughout the year, flock sizes tend to be larger than for contract egg production, most producers, endeavouring to have at least two equally-spaced flocks a year. In addition, all production responsibilities lie with the producer, so that the contractor is not normally involved in financial risk.

Independent semi-integrated operators

This type of production is carried out extensively and is operated by a one-man management unit. Such units would normally start as a small production unit buying in pullets and selling eggs to a wholesaler. With increasing competition and decreasing profit margins, many have expanded and most rear their own replacements. In many cases direct marketing arrangements are made with retailers or consumers, eggs being graded and packed on the farm. In some cases such producers may belong to a co-operative feed mill or egg packing station or both. This is the type of producer, however, who is his own manager and will not expand beyond his own managerial capacity, owing to the risks foreseen with employed

supervisory skill. I saw two such farms (both in Connecticut supplying the New York market) and in each case expansion had reached its maximum in the lifetime of the owner, the one being a unit of 42,000 pullets and the other 55,000.

Independent integrated operations

As opposed to the semi-integrated operator, this type of producer is prepared to go beyond the limitations of his own management ability and employ extra management capacity in order to take full advantage of economies of scale and thereby minimize production costs. Such units are very fully integrated, manufacturing their own feed, rearing their own replacements and with their own packing station and retail outlets. In some cases they also have their own breeder flocks. Since the whole process of production and marketing in such units is co-ordinated and streamlined into the one process, they are in a position to produce eggs at least cost.

Low egg consumption

In the light of the trends in the U.S. egg industry and the methods of production involved, it seems most probable that if any mammoth egg production unit is to develop there, it will be in the form of a fully-integrated production and marketing unit, where costs of production can be minimized. If there should be any increase in such large units, then it is likely that contract production will diminish, since costs will always be higher on such a system.

But whilst costs of production are lowest on large units (since economies of scale operate up to a very large number of birds), there are certain qualifying factors which must be favourable if all the advantages of scale are to be realized. The most important of these seem to be:

- (a) a market which is able to absorb every increase in production without price depression;
- (b) the willingness of the owner to assume greater capital risks;
- (c) the ability to obtain the necessary capital;
- (d) the availability and satisfactory nature of acceptable labour and managerial staff.

One of the main restrictions on mammoth expansion in the U.S.A. must be the state of the egg market. With falling demand, egg prices will tend to fall; and with narrowing profit margins the result could be twofold. More producers will divert their facilities to alternative uses, going out of egg production and as a result reducing the number of farms still further, and those producers who remain will make every effort to reduce costs by increased efficiency and also by expanding.

At the present time economists estimate that the increases taking place in flock size are offset by the number of farmers going out of egg production. As producers become larger, however, more and more capital is at stake and therefore the more difficult it becomes for such projects to be abandoned or put to alternative use. Thus the situation arises when egg output for the nation increases with those farmers remaining struggling to increase turnover and the price situation becoming even worse.

It has been calculated that in the U.S.A., even at the 1958 rate of consumption (343 eggs per head), only 1,000 flocks each of 250,000 birds would produce the total table egg requirement for the nation. (As population increases the outlet for eggs for manufacturing purposes will doubtless increase, but this figure is included in the data for *per capita* consumption. In any case the price received from egg breakers is less than that which is obtained for eggs sold for table purposes.)

Levelling out of prices

The change in the location of egg production resulting in egg surplus areas which were previously deficit areas will mean that producers in such areas will be competing for markets elsewhere. With the improved road communications between states and the modern methods of transporting perishable goods so that quality is maintained, this is more economically feasible than it would have been fifteen years ago. Transport costs are not sufficiently high to deter low-cost producers in one region from seeking markets for their eggs in others. This situation is likely to arise most quickly as between the south and the north-east. The south now produces more eggs than it consumes, has a large number of large farms and also comparatively low housing and labour costs. The higher egg prices in, for example, the New York market, compared with those locally, more than offset transport costs. Whilst producers in the northern areas have been able to offset their fairly high production costs by higher egg prices, they may have to turn to newer methods and more integration if they are to remain in business in face of the encroaching competition from cheaper production areas with its consequent depressing effect on egg prices.

In face of the probable levelling out of egg prices throughout the States and their overall depression as producers in surplus areas seek markets elsewhere, only two methods remain to the industry if prices are to be maintained without controls. These are either to stimulate demand (but because of the inelastic nature of the demand for eggs this would not be accomplished easily by price alone), or for egg output to be restricted by one means or another.

Shortage of capital

At a time of falling profit margins, expansion is likely to be restricted by the lack of available capital. Even in a favourable situation, expansion in any industry involves the owner of an enterprise in considerable capital risk, and unless he can see a guaranteed future for his product he will be even less willing to invest more of his assets in the same undertaking. The availability of outside capital will also be less when future prospects are doubtful, available funds being attracted to other more hopeful projects and where a higher return on money invested is likely. Further, with deteriorating prospects the negotiation of loans for capital investment is less easy and interest rates higher. The egg industry is likely, therefore, to be short of outside capital until such time as it can show the probability of higher returns. In fact, many operators of contract production schemes are now considering changing to production on their own integrated units, but in most cases the problems of finance for the setting up of the production unit was limiting this trend. In spite of the dangers of integration to the

feed firms, there is not likely to be the same investment in egg production by them as there was in the broiler industry, in the main because of the higher investment required and the longer-term nature of the enterprise.

So far as management is concerned, this human feature is perhaps even more vital in the mammoth poultry enterprise than in any other business undertaking. Poor management skill can annul any cost savings made by large-scale production very quickly and is one of the most vital inputs of the whole operation. As profit margins fall, however, it may become a scarce commodity since better future prospects may be available in other spheres. The essential nature of good management to the success of a poultry enterprise is well-known to farmers, many of whom will not expand beyond their own managerial capacity for this reason.

Summary

Whilst the scale of egg production enterprises in the United States is expanding, the largest integrated operations are still limited to around one million birds. There may, however, be contract operators involved in the production of eggs from more than this number of birds in total, but these are from individual producers each with comparatively small units. Whilst there are indications that in order to reduce production costs more large, fully-integrated operations may appear, it is unlikely that they will expand to the mammoth size of the one planned in this country.

The three main limiting factors to such expansions which will tend to intervene before full advantage has been taken of all the possible economies of scale are (a) the egg market situation in the States with its downward trend in consumer demand, (b) the depressing effect this is likely to have on the availability of capital for expansion in face of the expected lower profit margins, and (c) the difficulty of obtaining satisfactory managerial capacity, which becomes more and more essential as expansion proceeds.

(The author's first article on this subject appeared in last month's issue.)

N. D. O. Capper

Syndicate

Grain

Stores



Membership means money saved and money earned

THERE are no barley barons in Herefordshire. At least I don't know of any. Our cereal growing is on a fairly modest scale compared, for example, with that of East Anglia. Although the grain we grow is important in our farming economy, few of us grow cereals on a scale to warrant high capital investment in farm storage and drying plants—which is one strong argument in favour of a co-operative approach on syndicate lines.

In my opinion only the big specialist cereal growers have an argument for storage and drying plants on the farm. For the rest of us it is usually a waste of money, and the cuts in cereal prices last February remind us of the likely trend ahead. Every cereal grower in this uncertain climate of ours would do well to look into the economics of any grain storage syndicate he can find in his area. Apart from the very real economy in operation, in drying, cleaning and storing, and in processing (the invariable follow-up) there is the important factor of premiums to be earned under the wheat and barley incentive scheme. This season, remember, seasonal standard prices of wheat increase by £4 10s. a ton from July/September to May/June next year, and barley premiums from 6d. to 1s. 3d. a cwt are to be earned between January and June. Membership of a grain syndicate means money saved and money earned. It's as simple as that.

Capital costs

True, the capital cost of building and equipping storage and drying plant is high, but not when a dozen or twenty farmers go in together. The cost per ton is then reduced to a minimum, and the smallest producer can share the best equipment. A warning here: it is worth while employing firms who are experienced in the job. Experiments can be costly. As in all such co-operative ventures, it needs someone to shove and cajole his neighbours into action, even to the point of risking some unpopularity. That won't last long.

Our grain storage syndicate at Bodenham was the tenth syndicate formed in Herefordshire, but there are now at least 70 syndicates of various kinds in the county. It began modestly in 1961, and was formed in the normal way by thirteen of us joining together and borrowing 80 per cent of the capital through Herefordshire Syndicate Credits Ltd. at $1\frac{1}{2}$ per cent above bank rate over five years.

As far as cereal production goes, we are all small-scale men, with 20–100 acres each, but with farm acreages from 100 to 800. We started our syndicate modestly, with a capacity of 400 tons only, but with plans that would allow easy expansion. The response was greater than we expected, thus proving that farmers *can* move with extraordinary rapidity once they are convinced. In the second season capacity was expanded to 1,000 tons. The plant's capacity is now 1,500 tons of storage, with a throughput of up to 2,000 tons and a capital share of 1,000 units or tons. There are forty-six steel bins. Even in wet weather the water-table is only at about 16 feet, and this has enabled us to install four good 9-ton pits and twenty self-emptying bins which keep perfectly dry.

Assuming that a member wants storage capacity for 20 tons, the capital cost works out as follows:

	£	s.	d.
Initial payment	77	12	10
*Fourteen half-yearly payments of £21 9s. 1d.	300	7	2
Total capital cost	378	0	0

*When we borrowed, it was for 5 years. Now the loan is for 7 years on fixed equipment.

The initial payment, of course, represents his share of the total deposit of one-fifth on the capital cost of the plan, and he receives normal capital and investment allowances. Our total capital costs amount to £26,000, of which the Ministry grant comes to £7,000 payable over five years. A point to remember is that the syndicate itself is responsible for interest payments until the first Ministry instalment arrives. Within two years now our repayments will be completed and we shall own our plant. It is then that every member will congratulate himself on his foresight back in 1961.

Scope for expansion

These plants have a habit of growing, and Bodenham began the habit earlier than most, but many have followed. Within two years we installed a substantial secondhand hammer mill with a new crusher and mixer and all the necessary bins and elevators. The following year we added a cubing machine, with a throughput of 1 ton an hour or 1,200 tons a year, with the peak in March. This machine is now proving too small. Then came the seed-dressing



The syndicate's grain drying and storage building

plant, which proved popular last autumn when over 30 tons were dressed. This year we have added to the cuber an injection plant for molasses and a 20-ton weighbridge.

More than half the grain we store is processed. We are saving £5-8 a ton by mixing straights and minerals for our own compounds, and most members depend on our excellent operator for 100 per cent of their supplies. There is not one of them now who is not convinced that his own cereals (the syndicate's, anyway, since individual lots of barley lose their identity) is as good as, or probably better than, 'Brand X Super Special' that went all the way to Bristol or Liverpool. Most of it, too, leaves the plant in a 3½-ton bulk trailer (with auger). All grain is now handled in bulk, and that first season when we heaved the grain in bags seems a long time ago. There is also space in the building for an additional 200 tons of bagged grain, for which no charge is made, provided the members bag and stack their own.

During the first two years we employed a part-time operator with help during twenty-four-hour operating periods through the harvest. He now works full time, and his wages, insurance, and fuel and electricity charges, etc., are covered by a charge of £1 per ton for cleaning and drying from 20 to 14 per cent. Where a member exceeds his quota (let us say in the above example of 20 tons), the charge is increased by 15s. a ton as a penalty for his miserly capital share! We charge 2s. 6d. per cent for moisture over 20 per cent, and 12s. 6d. a ton for cleaning only.

Sheer common sense

It is fair to claim that most grain owned and stored by syndicates commands a premium based on quality. It is well handled, of level quality and moisture content, easy for bulk loading and available when required. There are some member-to-member sales in the Bodenham syndicate, but with such a high proportion processed for consumption on members' own farms, relatively little is available for outside sales. I know of at least one syndicate, however, whose grain commands a premium of 10s. a ton.

The site of the Bodenham plant is nearly an acre in extent, and is held in trust for the syndicate by three of the younger members. The management committee of three is elected each year and meets only two or three times. An annual meeting of all members deals with the accounts. It is as simple, and as successful, as that.

As I have said before, the syndicate approach to the purchase and operation of machinery and plant is based on sheer common sense. That is why there are more than 600 syndicates of all kinds in the country today and why none has failed so far.

N. D. O. Capper, J.P., farms 800 acres in Herefordshire. His mixed system includes hops, currants, rearing of beef cattle, Clun sheep and cereals (mainly winter wheat).

The Ministry's Publications

Since the list published in the August, 1965, issue of *Agriculture* (p. 399) the following publications have been issued.

ADVISORY LEAFLETS

(Price 4d. each—by post 8d.)

No. 321. Eyespot of Wheat and Barley (Revised)

No. 370. Cauliflower Mosaic (Revised)

No. 465. The Mobile Glasshouse (Revised)

FIXED EQUIPMENT OF THE FARM LEAFLETS

No. 26. The Repair and Maintenance of Farm Buildings (Revised) 2s. (by post 2s. 4d.)

FREE ISSUES

The A.L.S. can Advise You

The priced publications listed above are obtainable from Government Bookshops (addresses on p. 520), or through any bookseller. Unpriced items are obtainable only from the Ministry (Publications), Government Buildings, Tolcarne Drive, Pinner, Middlesex.

33. Downham, Norfolk

P. C. Weston

THE Downham district is centred on the small country town of Downham Market, on the River Ouse 12 miles south of King's Lynn. The town also lies on the dividing line between two soil types—almost two different worlds of farming thought and custom.

To the east the land rises to the Brecklands, where the soil is poor, flinty sand overlying chalk. Here the farmer's greatest fear is drought. To the west is the Fen—an endless flat landscape of black soil—looking like well-mixed bulb fibre and soot, interspersed with deep dykes. Here the farmer's fear is flooding. Most of the land is below sea level, some as much as eight feet, and massive pumps are needed to lift the drainage water into the rivers which run between high banks.

The district is almost entirely dependent on farming for its livelihood; 80 per cent of the area is in cash crops, mainly cereals, potatoes and sugar beet, and there is a considerable acreage of vegetables grown on the field scale.

The most intensively-farmed area is on the peaty fen around Downham. To the 'stranger's eye' these peats look very similar but they vary tremendously in character and cropping capacity. The better fens have a silty clay subsoil; the poorer ones are on soft chalk or sand.

Good drainage is vital, and the several Drainage Boards are responsible for maintaining the main dykes and the all-important pumps. To meet their costs a drainage rate is levied varying from 10s. to over £2 per acre. To reduce the flooding risk, a relief channel running parallel to the River Ouse has recently been cut. Sluice doors enable water to be transferred to the relief channel when high tides prevent water flowing out of the River Ouse. The relief channel runs southwards into Suffolk and takes water from the subsidiary rivers to prevent it getting to the fens. This scheme cost £13,000,000.

Crops vary in the peat areas. To the north, around Downham West and Stow Bardolph, most of the holdings range from 20 to 60 acres with sugar beet, wheat and potatoes as the main crops. The proportion of potatoes is high, up to one-third, so eelworm is never far from the crop—or the farmer's mind. The farmers here are either tenants of the Norfolk County Council or owner-occupiers. Valuing their independence, each must have his own

machinery. Fixed costs are, therefore, high and every acre must pull its weight. Crop yields are well above average, but any suspicion of disease, pest or deficiency brings an anxious inquiry to the District Officer.

Further south, from Denver Sluice to Brandon Creek, the soil is deeper and the range of crops greater. Carrots, celery, mustard, herbage seed and harvest peas, as well as beet, potatoes and wheat are commonly grown, and on the more mature peats parsnips, red beet and onions have been introduced.

Because of the speculative nature of vegetable growing, more and more farmers are interesting themselves in better marketing. The pickling onion is now a recognized trade with growers getting together for drying and grading. More and more vegetables are being sold on contract to processors and multiple stores. Carrots are often sold in the ground to merchants who lift and market them. One grower has recently erected his own cold store to keep celery and other vegetables till prices improve.

The farms in this area are larger, and in many cases advantage has been taken of the Farm Improvement Scheme to erect new grain and potato stores.

Livestock—apart from the occasional bullock yard or piggery—are few and far between. But on some of the lighter peats grass can grow in abundance if treated generously with potash and nitrogen. There are two large grass-drying plants situated on the peats, grass utilized in this way being more attractive than cereals on the poorer peat soils.

Quite apart from drainage, there were a number of problems to be overcome before the full value of the peats could be tapped. Crops would be stunted for little reason until the soil chemists found a shortage of several trace elements. Now copper and manganese are used as routine. The wind, too, can play havoc with the young crops. When the soil 'blows', the dykes are filled, some crops are buried and others lifted from the ground. Within the last fifteen years the planting of purple willow hedge, which quickly grows to 15 feet, and the new technique of drilling single rows of barley in wide rows a few weeks before drilling high-value root crops, serve to anchor the soil.

Having grown a good crop, one difficulty was to get it to market—for there were few roads, and between the wars farmers were largely dependent on a light railway. During the last war many miles of concrete roads were constructed, but the unstable nature of the soil means that the road takes on a look of 'colliery damage' and provides a switchback ride for the fast driver.

The contrast between the fen and the light land to the east is immense. Here the farms are very large to compensate for the poor soil—much of which would run well in an hour-glass. Anyone with less than 500 acres finds it difficult to make a reasonable living. Low rainfall makes grass an unreliable crop and cereal yields can fall to disastrous levels. Gone are the sheep flocks of history, and cereals, sugar beet and herbage seeds are the main crops. There is little livestock apart from some vast folded flocks of ducks, which whiten the landscape and improve the fertility of the soil. Irrigation is possible on some farms near the rivers, where profitable vegetable and early potato crops are being developed. A common feature of this area is the Scots Pine wood, with hedges of the same tree, sometimes lopped at eight feet.

J. F. HOARE

*Agricultural Land Service,
Nottingham*

Trespassers will be Prosecuted

THERE is no record of the date on which the first of these remarkable, and completely unenforceable, notices started appearing in the countryside—for basically no trespasser can be prosecuted in the accepted legal sense. He (or she) can only be sued for damages in the Civil Courts. The use of the word 'prosecuted' in such notices certainly has a more ominous ring to it than 'sued' and, remotely, anyone trespassing might imagine he was committing a criminal offence. In fact trespass can hardly ever be a crime, but something a long way down the list; it is one of a large number of 'wrongs', called a tort.

A second popular misbelief is that a trespasser must actually cause some damage before an action can be brought in the Courts. Legally, a trespass exists when anyone is on another person's property unlawfully, without any physical damage being caused at all, and an action for trespass could be started immediately. Most farmers would hesitate to bring an action against a solitary trespasser. But trespass can reach such alarming proportions, with fires being started, cattle or sheep being let loose, or real damage to crops being caused, that strong legal action (other than suing for damages for trespass) sometimes has to be considered, perhaps under the Malicious Damage Act 1861.

A farmer does, however, have a second remedy available to him (apart from suing for damages)—that of physical ejection of the trespasser, which is probably most effective where there is a large 16-stone farmer and a smaller, truculent and offensive 11-stone trespasser! There are inevitably some dangers involved in an action of this sort, for the trespasser *must* be asked to leave peaceably first of all, and then (and only then) may physical force be used. Furthermore, the amount of force used must be 'reasonable'—too much, or of the wrong sort, might involve the farmer in a counter action for damages, or even assault. Even trespassers have some rights, and the one-time liberal use of spring guns, man traps, and other effective but rather unpleasant deterrents, became illegal generations ago.

Trespassers are not restricted to the two-legged variety, for dogs can create an appalling amount of havoc amongst sheep flocks, particularly at lambing time, and amongst cattle too. Here again, action lies primarily in the Courts, since the owner of every dog is liable for any damage it may cause to cattle (which are legally defined for this purpose as horses, goats, sheep, pigs, asses and mules) and also to poultry. Furthermore, if any dog can be proved to have caused previous injury to cattle, the Courts have powers to order the destruction of the dog.

The sight of a dog chasing a flock of sheep or stampeding a herd of cattle, however, rarely invokes thoughts of Court action by the farmer against possibly an unknown owner. More often there is the thought of something speedy and effective, such as a 12-bore. At this point, wise is the farmer who thinks again before discharging a well-aimed ounce of No. 6 shot, for dogs (as well as human trespassers) have quite a measure of legal protection tied to them under an old 1861 Act. Even the wounding of a dog, let alone the killing of it, without proper legal justification is in itself an offence, and may result in the farmer having to answer a summons by the owner of that dog, whether it be a mongrel or pedigree. Any successful defence against an action of this sort would need to be based on two essential principles, which were reiterated as recently as 1961 in a High Court action. Briefly these were, firstly, that the dog was actually attacking the cattle or sheep, or was about to renew another attack, and, secondly, that shooting was the only possible, reasonable and practical way of stopping the attack or preventing a renewal. Unless these two conditions are satisfied, a farmer, no matter what his feelings are at the time, has no *legal* right at all to take a shot at any dog.

Trespass need not necessarily be restricted to the farm's surface either. It can legally exist both underneath, by unlawful mining, for example, or in the air above the farm by aircraft, for ownership and the occupation of a property can extend both upwards and downwards. However, the likelihood of successful actions being brought for trespass in these circumstances are remote in the extreme. Parliament long ago foresaw their possibility with the passing of certain Acts, such as the Air Navigation Act of 1920 (subsequently replaced by the Civil Aviation Act 1949) which virtually prevented any action for trespass (or nuisance) being brought against aircraft provided they behaved themselves reasonably well; the same Act still applies today.

Yet—though 'Trespassers will be prosecuted' may not be legally correct—what alternatives are possible? 'Trespassers may be proceeded against'—hardly. Nor even 'Trespassers will be sued'. Perhaps one farmer had the best answer with his notices of 'Dangerous bulls run loose here' near his grassland and leys, and 'Danger—Chemical sprayed land' adjoining his arable. After all, not every townsman can tell a bull from a bullock at a distance, nor is he likely to know that the sprays are probably harmless anyway.

IN BRIEF

Liver Fluke—a bad winter forecast for the West

Not only do wet summers spoil our holidays in this country, but they also serve to determine the pattern of events for the forthcoming winter for the sheep farmer. In addition to causing poor harvesting conditions, leading to a precarious winter fodder situation, they also influence directly the incidence of losses, particularly in sheep, from liver fluke disease.

Few will have forgotten the catastrophic losses following the wet summer of 1958 when, in the winter of that year, 80,000 ewes died in North Wales alone. Since that time a great deal of effort has been spent on research into ways of preventing the heavy losses which occur about once in seven years. One step has been to establish a method of forecasting the likely situation in any given winter. This forecast, together with relevant advice, is issued in August each year.

This year the Ministry's official forecast indicated that, because of the wet summer, losses from liver fluke in Wales and north-west and south-west England will be nearly as high as they were in the winter of 1958-59. Arrangements have therefore been made for each farmer in the affected areas to receive a leaflet drawing attention to the danger and giving relevant advice on preventive measures.

The liver fluke worm can be said to be responsible for three disease conditions: chronic fluke, acute fluke and black disease. The two latter are the more serious, but attention must be given to the prevention of all three. The part played by the mud snail in this complex of diseases is now well known, hence any measure taken to prevent them will need to take cognizance of the snail and its whereabouts on the farm. Furthermore, since there is no drug available which is capable of killing flukes of all ages in the liver, reliance placed, as in the past, on the simple expedient of treating fluke-infested sheep is not enough.

This year, since losses from black disease may have begun in mid-September, vaccination against this disease should have been undertaken at once, injecting all sheep (not previously treated) twice with an interval of two weeks. Likewise the entire flock should have been moved off flukey land from September for the rest of the winter where this is possible. Failing this, flukey areas might be fenced off or treated with molluscicides (copper sulphate: 28 lb per acre mixed with sand as a spreader, or sodium pentachlorophenate: 10 lb per acre as a spray), taking care to keep sheep off the treated areas for two weeks unless there is plenty of rain.

If none of these things can be done, every effort should be made to get the flock off flukey land during October, November and December—the peak danger period.

Lastly, the dosing of sheep should be commenced in early October and should be continued on a monthly basis until March. In certain cases it may prove necessary to use above-normal doses of the relevant drugs. Where this is found necessary, farmers are advised to consult their veterinary surgeons before they embark on such a programme since there is an element of risk from poisoning.

If the above advice is acted upon, farmers in the hard-hit areas can face the winter, bad though it is going to be, with a certain amount of calm.

W. T. Rowlands

Farm Equipment . . . Buy or Hire?

A discussion of 'capital leasing', an American development of possible interest to British farming.

We hear a certain amount nowadays about the possibility of farmers hiring machines and even farm buildings instead of buying them outright. You hear a good deal more about it in the U.S.A., where the practice, though recent in origin and by no means general, is now becoming established. What can we learn from American experience of this system?

The system defined

First of all we need a definition. The American farmer, like the British farmer, has, of course, long been familiar with the short-term hire of equipment for so many hours at so much an hour. But the new form of long-term lease is a very different matter. Under this system, a farmer hires any type of equipment—a silo, a grain-drying plant or a poultry house, a combine, a tractor or a drill—for a period of years, generally between three and eight years. During this time he pays an annual, quarterly or monthly rent for it, the total of this rent generally being greater than the purchase price of the equipment. He has full use of it while he rents it. But the firm from which he hires it remains the owner and he agrees by contract to take reasonable care of it, insure, maintain and repair it, and allow the owner right of access to inspect it.

At the end of the leasing period, various possibilities arise. The farmer may continue to hire the equipment at a lower rent; he may buy it at some previously agreed basis of valuation; or he may return it. It depends on the type of equipment and the terms of the agreement. What happens if he wants to return a building? Nobody knows, for the system has not been in operation long enough for such questions to arise. But they are not likely to prove difficult in practice. They would be settled by contract or common sense.

A new form of credit

The general background to this system is familiar; the farmer who wants equipment does not always find it easy to raise the capital to buy it. But if he leases it he incurs no capital outlay. His initial investment is no more than his first instalment of rent. The system, in fact, offers him a new form of credit, which is why this type of lease is usually called a 'financial' or a 'capital' lease to distinguish it from the short-term 'operating' lease. And it is credit without security other than the general confidence of the hiring company, for the equipment provides its own security. If the farmer fails to pay his rent the contract generally requires him to sell the equipment and pay the proceeds, plus any deficiency, to the firm from which he loaned it.

The main disadvantage of this system is cost, for hiring is not cheap. But generalizations are futile, for this is essentially a matter for individual decision. Every American economist who has discussed this system emphasizes that, before deciding, the farmer should take financial advice and prepare careful budgets to compare the relative costs of leasing and the other alternatives open to him. A great deal depends on the degree to which he can secure income tax benefits; and income tax is as complicated and personal a matter in America as in Britain.

Views of farmers

The present extent of capital leasing in America is not known. Statistically, it is probably small. But the practice has 'arrived' and a number of farmers are interested in it, at least in principle. Thus, suppliers of equipment find that it gives them a new line of approach, particularly to the more substantial farmers

who are most likely to be attracted by the tax advantages of the system, and so encourages custom which might not come otherwise. One firm, for instance, reported that an advertisement which offered leased buildings brought twice the response of conventional advertising.

In more detail, a recent survey of farmers found that 40 per cent had considered leasing buildings or machinery and that 13 per cent had actually done so at some time or another. A number of these farmers were probably thinking of short-term hiring. But the fact that some had hired buildings and that others were interested in the possibility of hiring buildings showed that many had accepted the idea of capital leasing as practical politics; or, more accurately, as practical economics. And 70 per cent of those questioned expected the practice to grow, though slowly.

Of course, conditions in America are very different from those in this country. But the basic problem to which capital leasing offers a possible answer is the same on both sides of the Atlantic. Is it likely to develop over here? That depends on you. But it might be worth considering.

Nigel Harvey

Farm Classification in England and Wales

How many farms are there in the country? How varied are they? And what is their cropping and stocking like? Those interested in the answers to these questions will find a mine of information in the publication *Farm Classification in England and Wales, 1963*, recently published by H.M.S.O., price 5s. 6d. (by post 5s. 11d.).

All holdings returned at the June, 1963, census with 275 standard man-days or over, i.e., full-time, have been classified into thirteen enterprise types—'predominantly dairying', 'general cropping', etc.—and the first part of the publication shows the numbers of holdings by type, size and location, and the distribution of crops, livestock and workers among the different types and sizes of holding. This method of classification has recently been developed in the Ministry of Agriculture, Fisheries and Food and adds a new dimension to the census statistics.

The ubiquity of the predominantly or mainly dairying enterprise is, for example, strikingly borne out by figures in Table 1A which show that the proportion of such holdings varies between 30 and 60 per cent in every region except East Anglia; there, however, cropping takes pride of place with nearly 50 per cent of the full-time holdings.

The second part of the publication shows the distribution of holdings by farm size and the size of individual crop and livestock enterprises. Table 16 shows, for instance, that although cereals are grown on 136,000 holdings in England and Wales, 20 per cent of the cereal acreage is grown on only 2 per cent of these holdings. This section continues a useful series of analyses of the structure of agricultural production, examples of which have been published from time to time in *Agricultural Statistics, England and Wales*.

Changes in the Poisonous Substances Regulations

An amending regulation laid before Parliament on 17th August, 1965, added two new chemicals, thionazin and fentin hydroxide, to the list of those to which the Agriculture (Poisonous Substances) Regulations apply. The Regulations came into effect on 18th August, 1965. This means that farmers and growers must by law ensure that their workers handling these chemicals observe certain precautions. The precautions include the wearing of protective clothing appropriate to the chemical in use and to the operation performed. Workers also have a responsibility to use the clothing provided, and no worker under the age of 18 is allowed to use these chemicals.

Books

Wheat: Botany Cultivation and Utilization.
World Crop Series. R. F. PETERSON.
 Leonard Hill Books. 95s.

Wheat is the first cereal dealt with in the World Crop Series. This book of 400 pages purports not to be a monograph on the crop, but it is the nearest approach since Percival's *The Wheat Plant* published in 1921. Its 20 chapters cover all the aspects of wheat from its origin, history and breeding to the utilization of the grain and international trade.

The preface states that 'the primary purpose of the book is to give the general reader and student a broad view of wheat in its main aspects on a world basis'. The book's main merit is that it is extremely readable, and it thus serves not only as a comprehensive work of reference but can also be read with considerable pleasure. Although dealing in places with quite advanced subjects, it assumes little specialist knowledge on the part of the reader, and has a pleasant way of introducing technical subjects.

The author is head of the Cereal Breeding Laboratory, Winnipeg, Canada, and, as might be expected, the chapters on cytology and genetics are comprehensive and the best in the book. Indeed, anyone wanting an interesting introduction to breeding might well do worse than read this section. The fascinating detective work which has traced the development of our present cultivated wheats from their wild progenitors is particularly well told. It is all the more surprising that the chapter on physiology is so sparse, and that recent work on such subjects as net assimilation and developmental studies, which are so vital to the breeder, is ignored.

The difficulty of dealing with a crop on a world basis becomes evident when describing aspects that differ widely according to region and climate, and there tends inevitably to be a New World bias. Thus the

chapters on cultivations, diseases, and the new varieties achieved by breeding, are necessarily cursory. There is, for instance, no mention of wheat bulb fly or of the existence of eyespot-resistant varieties, and scarcely any data on fertilizer rates, the newer herbicides or grain drying.

The book is said to contain information available up to the end of 1962. The paragraph on varieties in the U.K. reads very oddly. It suggests that we are still dependent on British-bred varieties, most of which are no longer obtainable, and there is no mention of Cappelle-Desprez. In England 'yields of from 50 to 65 bushels per acre are not uncommon'.

There are excellent chapters on the chemical composition, nutritive value and the utilization of the grain. There is a good glossary of technical terms, a bibliography of some 200 references to fairly general works, and a moderately good selection of photographs.

Dr. Peterson is strictly factual and only allows himself a few personal views in the short 'conclusion'. One cannot but admire that a single author should cover so authoritatively such a wide subject and at the same time make it interesting.

W.E.H.F.

Energy Metabolism. Edited by K. L. BLAXTER. Academic Press. 95s.

This record of the proceedings of the 3rd Symposium on energy metabolism held at Troon, Scotland, in May, 1964, includes the texts of the 41 papers presented and the ensuing discussions. The Symposium was organized jointly by the European Association for Animal Production, the British Society of Animal Production and the Hannah Dairy Research Institute, and was attended by invited representatives of centres throughout the world concerned with research in animal energetics, as were the two previous Symposia on the subject held in 1958 and in 1961.

The growth of this field of research is well illustrated by the fact that the 450 pages of this publication represent an increase of 70 per cent over those in the report of the 1st Symposium. The presentation has, moreover, been greatly improved. It is now produced in the form of a hard-cover edition, with concurrent improvements in paper quality, layout and printing, and English readers, at least, will be pleased to see that all papers and discussions have been translated into English.

The book is conveniently divided into sections dealing with various aspects of the central theme. Among these are the physiological and biochemical aspects of energy metabolism; respiration; calorimetric and comparative slaughter techniques; the evaluation of feeds as sources of energy; and environmental effects on metabolism. The report of a committee appointed to recommend constants and factors to be used in calculations of energy metabolism is also included.

This is an essential work of reference for all directly concerned with this sphere of study, be they research workers, lecturers or students. Others not directly concerned, and not familiar with the techniques and terminology of present-day research in energy metabolism, will no doubt find some of the work described difficult to follow. In spite of this, there are many people in the agricultural industry (to mention but one example, those engaged in advisory work) for whom a study of at least some sections of the book is to be recommended. They will thereby learn something of the complexities of the subject and obtain a valuable indication of the ways in which this vital field of research is so rapidly developing.

K.G.M.

surveyed area of 280 square miles. The second chapter deals with soil formation, genesis and classification. Four chapters give details of each of the 49 mapping units, together with representative profile descriptions, followed by a chapter devoted to a discussion of analytical data.

Following a historical introduction, the chapter on land use describes the present farming pattern and practices, local horticulture, orchards and forestry, with particular reference to soil conditions.

In addition the results of the survey add further knowledge to the depositional history and distribution of alluvium and peat in the Somerset Levels. New information is also brought to light on late and post-glacial events on the Mendip Hills.

Appendices define terms used in soil descriptions, give details of mineralogical data on limestone soils and tabulate the main characteristics and land use limitations of each soil series. The Memoir is illustrated with 16 plates, 15 text figures, coloured diagrammatic drawings representing the major kinds of soil, and includes two maps.

The publication is obtainable from the Librarian, Rothamsted Experimental Station, Harpenden, Herts, price 35s.

E.D.

The Soils of the Mendip District of Somerset.
(Memoirs of the Soil Survey of Great Britain). Agricultural Research Council.

This publication gives an account of the soils and land use in the country between Weston-super-Mare and Bridgwater and extending inland to Shepton Mallet. The district includes most of the Mendip Hills and a large part of the Somerset Levels as well as hilly country to the north. Although other occupations make increasing demands on available labour, land use and the general economy of this part of Somerset is still dominated by dairy farming.

The area is one of great geological and geographical variety but four main physiographic regions are recognized, each having characteristic land forms and soil patterns. A geographical approach has been maintained throughout the account, enabling the data obtained to be applied to neighbouring areas where similar landscapes are extensive.

An introductory chapter defines the physiographic regions and briefly outlines the geology, climate and vegetation of the

Les Variétés d'Avoine Cultivées en France.

C. MOULE. Institut National de la Recherche Agronomique. 53F.

In his introduction M. Moule contrasts the declining acreage of oats in France with a continuing increase in average yields and attributes these higher yields to improved agricultural practice and the cultivation of better varieties. The book, which is written in French, is one of a series published by the Institut National de la Recherche Agronomique, in which the varieties of particular crops are described in detail. It is, however, more than a catalogue of oat varieties. It includes a general survey of the crop and collates results and observations from the breeding stations of Versailles, Montpellier and Rennes. There are numerous tables and graphs in which original data are presented.

The book has five sections, the first two of which are concerned with species classification, with the origin and distribution of cultivated varieties and with descriptions of the morphological characters of the grain and vegetative parts.

In the third section, the agronomic characters of spring varieties are evaluated. Here, some aspects of the discussion of pests and diseases may be questioned. For example, the author appears to dismiss the use of resistant varieties in controlling stem-eelworm and he is wrong in stating (p. 159) that barley yellow dwarf virus has not yet been observed in Europe. The fourth section deals with winter oats.

There are detailed descriptions of some seventy varieties, with a key to their identification, and it is of interest that twenty-five of these were in cultivation before the last war. According to the author, 'l'agriculteur français, plus souvent prudent qu'audacieux en cette matière, hésite-t-il longtemps avant d'abandonner sa vieille variété'. This situation is not unfamiliar outside France!

The bibliography is conveniently divided under subject headings but there are several typographical errors in the English references. The colour plates are good but some of the black-and-white illustrations lack clarity.

This should prove a useful reference source for agronomists, plant breeders and crop inspectors.

G.J.

County Council Smallholdings in Yorkshire.

A Social and Economic Assessment.

MICHAEL BLACK. University of Leeds. 5s.

An inquiry from the Wise Committee on smallholdings motivated Michael Black to make this interesting assessment of smallholdings in Yorkshire. The farm labour force has been declining and no new land has been taken for smallholdings since 1940; thus the policy of improving the usage of existing holdings to enable farm workers to farm on their own account is the main theme of this report.

Mr. Black stresses the need to replace purely social considerations by economic and agricultural concepts in the future. He is anxious that the proper management of the valuable smallholding assets shall give a proper return to the Council as well as fulfilling their basic purpose. Estate incomes should be raised in order to provide better fixed equipment which would bring a better return both to landlord and tenant.

The author commends a 1929 report which suggested that the selection of tenants be based upon the three B's—Brains, Brawn and Brass—in that order!

He suggests that statutory loan facilities might be used to a greater extent to assist new tenants with good intellectual ability but insufficient capital. The West Riding County Council is praised both for the way in which it advertises its holdings and for the facility which it has to promote tenants from smaller farms to larger ones. However, very few tenants find further holdings outside the Council scheme. Mr. Black has employed standards in order to draw up income comparisons between County Council holdings and outside holdings of the same size. He finds that the County Council holdings compare favourably with others in Yorkshire and that their income is also comparable with industry. But the hours worked by the smallholder are high and there is considerable scope for improving labour productivity. The buildings which are normally supplied with a County Council smallholding were designed for mixed farms, whereas the majority of County Council smallholdings have now become specialized to a pronounced degree.

Mr. Black looks forward to the day when properly-equipped smallholdings will be providing an income of about £2,000 for their occupiers. At the same time the landlord's investment should be duly recouped by an adequate rent. Basic systems are suggested which could be adopted to achieve these ends.

This report will be welcomed by those interested in the so-called small farm 'problem'. Mr. Black's optimistic conclusion is that the well-equipped small farm, with a capable manager, may be no problem at all!

V.C.

Books Received

Gardening Chemicals

Lists of Insecticides, Fungicides, Herbicides and Associated Plant-Protecting Chemicals, under Trade Names and Common Chemical Names.

Compiled by John Forsyth, Audrey V. Brooks and Joyce Maynard. Royal Horticultural Society, Vincent Square, London, S.W.1. 4s. 6d.

Department of Hop Research Annual Report 1964. 6s. from The Secretary, Wye College, Nr. Ashford, Kent.

Forty-Fifth Annual Report of the Forestry Commissioners for the year ended 30th September, 1964. H.M.S.O. 8s. 6d. (by post 9s. 1d.)



Agricultural Chemicals Approval Scheme

Since the publication of the 1965 List, the following products have been approved:

FUNGICIDES

MANEB

Wettable Powders

Berk Maneb 80% Dispersable Powder—F. W. Berk Ltd.

HERBICIDES

2, 4, 5-T

Unformulated Esters

Kilbest M—Agricola Chemicals Ltd.

Chemicals for the Gardener

The following additional product for use in the garden has been approved:

P.B.I. Lawn Wormkiller — Pan Britannica Industries Ltd.

Based on derris.

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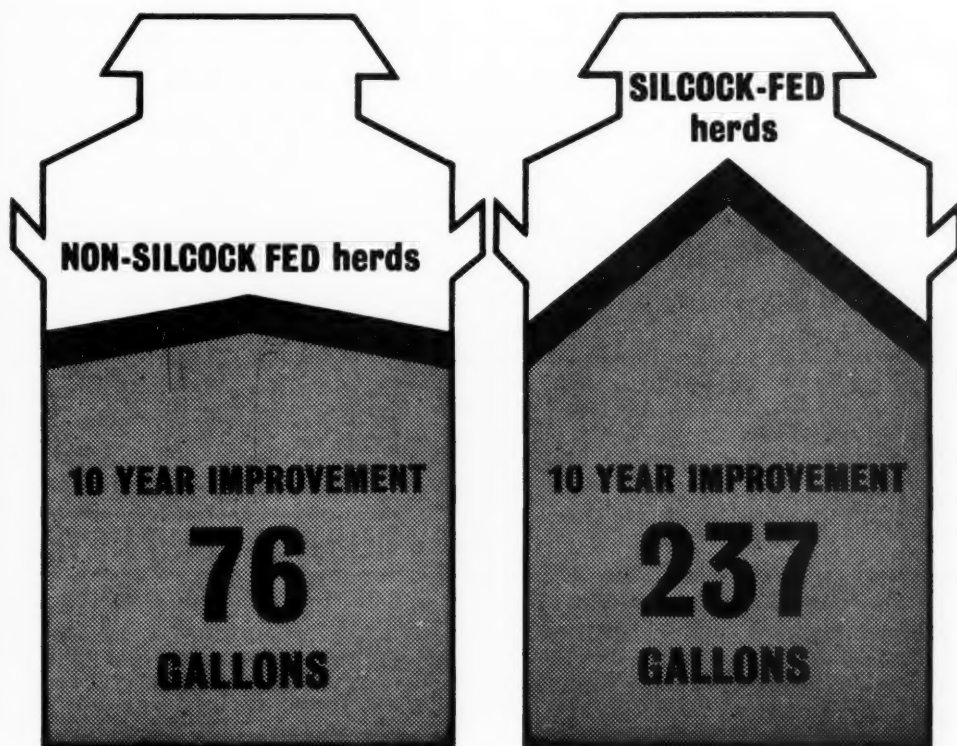
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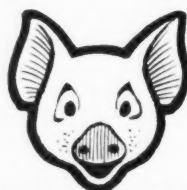
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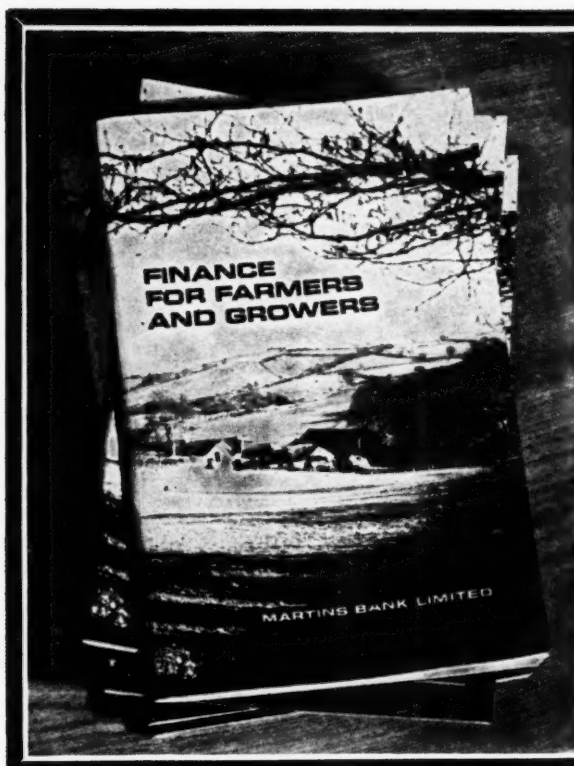
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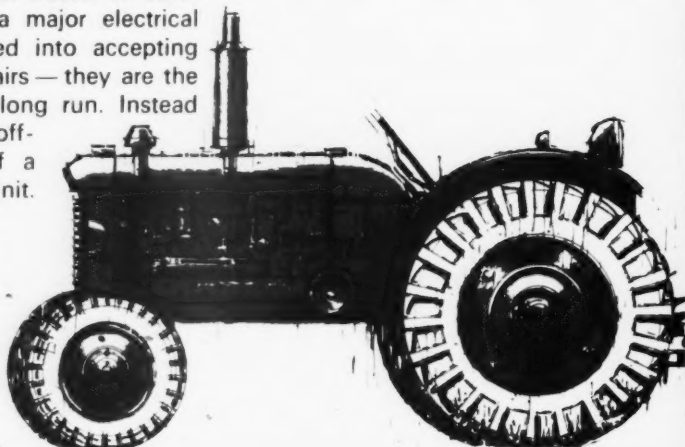


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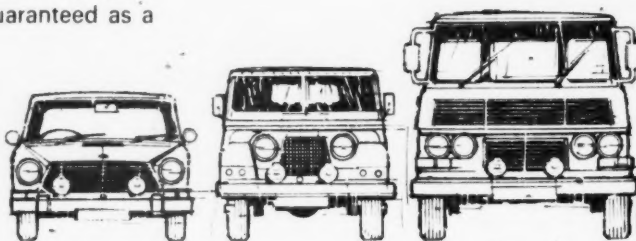
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